Research on Chinese Linguistics in Hong Kong 香港漢語語言學研究論文集

RESEARCH ON CHINESE LINGUISTICS IN HONG KONG

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Preface

A primary objective of the Linguistic Society of Hong Kong (LSHK), established in 1986, is to promote cross-fertilization between linguistic theory and the study of languages and dialects in China. This collection of papers represents one of its first publication efforts in this direction. The contributors of this volume are local and overseas members of LSHK, who are currently based in Hong Kong or have worked in the region in the past.

The seven papers span the fields of syntax and semantics, phonetics and phonology, the study of writing systems, as well as first and second language acquisition. They all attempt to relate language data in Chinese or Chinese/English interlanguage to issues in the general theory of speech and writing, or theories of language acquisition.

The two papers on syntax and semantics address very different issues. Chen Ping proposes a functional analysis of the Chinese reflexive *ziji*. He observes a number of descriptive inadequacies in formalist accounts of the reflexive, with respect to subject orientation, sentence binding and discourse binding, long-distance binding, blocking effects, as well as maximal clause and minimal distance effects. He argues that these can be explained in a coherent way if one appeals to notions such as pivot and topicality.

Kingkui Sin's paper on the translatability of law is an application of semantic concepts to a practical problem facing the Hong Kong community as Chinese is soon to become a language of the court in full force. It is a philospher's exposition of the linguistic assumptions, in his view unwarranted, that may have led to the belief that the Common Law cannot be translated from English into Chinese.

The papers written in Chinese for this volume bear on characteristics of Chinese sounds and writing. Cheung Kwan-Hin discusses the appropriate choice of IPA symbols to represent the so-called apical vowels in Beijing Mandarin. He points out that the established practice by Chinese linguists is not well-founded: the symbols for the apical vowels mistakenly called IPA symbols originate from the Swedish linguist Bernhard Karlgren, and are not IPA symbols at all. A number of alternatives for representing these vowels are explored in the context of the vocoid/contoid distinction and the view that these vowels involve multiple articulation.

Yau Shun-chiu traces the motivating factors that underlie the formation of a number of Chinese archaic ideographs. It draws from insights gained from the study of various sign systems, showing how the graphical representations of artifacts may have served as object referents in such characters as those for "shame", "woman", "emperor (self-address form)".

The remaining papers are on Language Acquisition. Colleen Wong's study of Cantonese-speaking children's understanding of anaphora, in both listening and reading tasks, is a condensed version of her doctoral dissertation completed at the State University of New York at Albany. It provides experimental data on children's interpretation of null and pronominal subjects in a number of constructions, including coordinate sentences and what Li and Thompson (1981) call realis descriptive clauses.

The Chinese/English interlanguage study by Virigina Yip and Stephen Matthews throws new light on why Tough-constructions are so difficult to acquire by Chinese learners of English. It is proposed that the persistent error pattern lies in the learner's reanalysis of Tough-constructions as Raising constructions. The learnability problem can then be conceived of as a reduction of the scope of both Raising and Passivization.

Thomas Hun-tak Lee reports a cross-sectional study of 4- to 8-year-olds' comprehension of sentences containing relative clauses in Mandarin Chinese. It looks at subject, object and indirect object relativization, revealing an order of acquisition that differs from parallel studies in English and other languages. A parsing analysis is proposed, arguing for the inadequacy of processing heuristics in explaining relative clause acquisition.

Insofar as the contributions in this volume give an indication of the range of linguistics research being conducted by LSHK members, two focal areas of research can be observed: a strong interest in modern perspectives on Chinese dialects, notably Mandarin and Cantonese, and a concentration in first and second language acquisition. It is hoped that this research publication series launched by the LSHK will function to facilitate exchanges between local and overseas scholars, and strengthen its continual effort to integrate linguistic theory and Chinese language study.

Thomas Hun-tak Lee

The Reflexive *ziji* in Chinese: Functional vs. Formalist Approaches *

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ABSTRACT

Considerable attempts have been made recently to accommodate the features characteristic of the interpretation of the reflexive *ziji* in Chinese, most notably, subject orientation and long-distance binding. In contrast to the formalist accounts that have been prevalent in the literature, this paper presents an alternative functional approach to the subject which maintains that the interpretation of *ziji* is best characterized by a functional account that depends crucially upon two notions, pivot and topicality. Specifically, it is proposed here that *ziji* tends to be bound to a referent that is pivot and stands high in topicality. All the recalcitrant data lend themselves to a coherent and natural explanation under the present theory based upon functional principles.

1. Introduction

The use of reflexives in Chinese has been an important subject of inquiries in Chinese linguistics and general linguistics during the past decade, particularly within the Government and Binding (GB) paradigm as developed by Chomsky (1981, 1986), Lasnik (1989), inter alia. Much heated discussion has been aroused over the interpretation of the simple reflexive *ziji* 'self', as well as the compound reflexives such as *ta ziji* 'him/herself', *tamen ziji* 'themselves', *ni ziji* 'yourself/selves' etc., on the seldom challenged assumption that they are the Chinese counterparts of the reflexives in English (cf. Huang 1984, Huang and Tang 1988, Battistella 1985, 1989, Battistella and Xu 1990, Cole et al 1990, Xu 1990, etc.).[1] The interest has been matched by similar investigations into the use of reflexives in other East Asian and Scandinavian languages, such as *zibun* in Japanese, *saki* in Korean *sig* in Icelandic etc., which are believed to share important features with the Chinese *ziji*, as different from the use of reflexives in English, Italian, etc. Comparative studies have been conducted in the attempt to reveal the similarities and differences between the languages in this respect. Similarities among the languages under investigation are interpreted as evidence in support of the universality of the GB framework, the Binding Principles (BP) in particular, whereas the differences revealed often motivate various revisions or reinterpretations of the principles concerned that are mostly subsumed under the fabric of parameterization.

The above studies within the formalist paradigm have thrown considerable insight into the use of the reflexives in Chinese, especially in interconnections with the interpretation of the other anaphoric devices such as pronominal and zero

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anaphors. At the same time, in my view there remains much to be desired with the current discussions, both in terms of explanatory elegance and empirical adequacy. In this paper, I will propose an alternative approach to the interpretation of the reflexive *ziji* in Chinese from a functional perspective. Comparison will be made, to the extent that such comparison is feasible and sensible, between the functional account to be developed here and the representative formalist treatments in the recent literature, both in terms of descriptive adequacy and theoretical elegance. Specifically, I will argue that the interpretation of *ziji* is first and foremost a pragmatic phenomenon that is barely susceptible to a characterization purely based on structural configurations of the constituents involved. At the same time, I will demonstrate that the interpretation of *ziji* is best accounted for with two discourse-pragmatic notions, i.e., [+Pivot] and [+High Topicality]. All the hitherto noted observations, mainly within formalist paradigm, and the new revelations to be reported here will receive a coherent and natural explanation under this theory.

The paper is organized in the following way. Section 2 starts with a brief account of the distribution of *ziji* in Chinese sentences, followed by a review of what have been generally regarded as the characteristic features of Chinese that distinguish it from English in the interpretation of reflexives. In Section 3, I will discuss major suggestions and proposals that have so far been raised in the formalist literature in the attempt to accommodate the features of the Chinese reflexive *ziji* to the general GB framework, with particular respect to the Binding Principles. I will demonstrate why, in the present formulation, they are considered to be inadequate on both theoretical and empirical grounds. In Section 4 , I will offer an alternative approach to the issue that is based on cognitive-functional principles. Specifically, I will argue that, by depending upon the notions of pivot and topicality, this approach not only accords well with all the observations concerning the interpretation of *ziji* that have been reported within the formalist paradigm, but also accommodates well all the recalcitrant data that so far defy any explanation that is exclusively based upon structural terms. Section 5 concludes with a discussion of the implications of my present exposition upon issues of general theoretical interest.

2. Distribution of *ziji* and its interpretation

2.1 Distribution

So far as its syntactic function is concerned, *ziji* occurs practically in almost any syntactic slot in a sentence that accepts an ordinary NP. Let's consider the following examples:[2]

(1) Lao Wang$_i$ bu xiangxin ziji$_i$
LW not believe self
LW$_i$ has not confidence in self$_i$

(2) Lao Wang$_i$ chou-le ziji$_i$ yi ge erguang
LW slap:PFV self one CL slap
LW$_i$ gave self$_i$ a slap on the face

(3) Lao Wang$_i$ conglai bu wei ziji$_i$ zhaoxiang
LW ever not for self think
LW$_i$ never thinks for self$_i$

(4) [NP Ziji$_i$ de buxin] changchang shi ta$_i$
self NOM misfortune often make him
gandao tongku
feel bad
Self$_i$'s misfortune often makes LW$_i$ feel bad

(5) Lao Wang$_i$ zhongyu renchu-le ziji$_i$ de haizi
LW at:last recognize:PFV self NOM kid
LW$_i$ at last recognized self$_i$'s kid

(6) Lao Wang$_i$ xiwang [S ziji$_i$ ye neng dao ner qu]
LW wish self also can to there go
Lao Wang$_i$ hopes that self$_i$ can also go there.

(7) [S Ziji$_i$ mei kao-shang daxue] shi
self have:not pass-exam college make
Lao Wang$_i$ hen bu gaoxing
LW very not happy
That self$_i$ didn't pass the college entrance exam made LW$_i$ very unhappy

In (1), (2), (3), (4) and (5), *ziji* functions as direct object, oblique object, and possessive respectively; In (6) and (7), as subject of the embedded clause. In comparison, the English reflexives are more restricted in syntactic distribution due to their morphological encodings. Uses as in (4), (5), (6) and (7) are ruled out, as exemplified by the following sentences:

(8) *John has trust in himself's friends
(9) *John hopes that himself can go there, too

To account for the ungrammatical uses of reflexives as in (9), it is stipulated in the GB framework that anaphors such as reflexives and reciprocals are excluded from the nominative subject position since there is no NP in an S that c-commands the subject, which violates the stipulation that anaphors must be bound in its Governing Category (GC).[3] As is evident from the above examples, the stipulation applies to English reflexives, but obviously not to *ziji* in Chinese.

2.2 Interpretation

Since theories of anaphoric interpretation of Chinese are so far developed after principles that were originally proposed for English, it is appropriate to start with English examples.

In the standard GB paradigm as explicated in Chomsky (1981, 1986 etc.), three types of overt expressions are identified, namely anaphors, pronouns, and referring expressions, as exemplified in the following sentences respectively:

(10) a. John hit **himself** (anaphor)
b. John hit **him** (pronominal)
c. John hit **the man** (R-expression)

Three Binding Principles are formulated in the endeavor to capture the interpretation of the three types. They are represented as the following (cf. Chomsky 1981, 1986a, 1986b, Lasnik 1989):

(11) Binding Principles
A. An anaphor must be A-bound in its Governing Category (GC)
B. A pronominal must be A-free in its GC
C. An R-expression must be A-free everywhere

where a GC is defined as:
β is a governing category for α iff β is the minimal category containing α, a governor of α, and a SUBJECT accessible to α (SUBJECT refers to AGR in a finite clause, regular NP subject of an infinitival clause, and NP of NP (if present) in an NP)

As the above formulation claims for universal validity across all human languages, it has been put to test with languages other than English since it was first proposed. At first sight, Chinese data do support the above theory, as the literal counterparts of (10) in Chinese follow the same Binding Principles in the interpretation of the three corresponding types of expressions. Consider the following sentences:

(12) a. Lao Wang$_i$ da-le *ziji*$_{i/*j}$
LW hit:PFV self
b. Lao Wang$_i$ da-le *ta*$_{*i/j}$
LW hit:PFV s/he
c. Lao Wang$_i$ da-le *ne ge ren*$_{*i/*j}$
LW hit:PFV that CL person

Upon closer examination, however, it was soon found that there are substantial differences between Chinese and English in the interpretation of the above-mentioned expressions. So far as the reflexives are concerned, it has been established that there are two major aspects in which Chinese differs from English. One is what is generally referred to as 'subject orientation', and the other is 'long-distance binding'. I will discuss them in turn.

2.3 Subject Orientation

First, let's look at subject orientation of the interpretation of *ziji*. It has been observed that while the English reflexives can find their antecedents in the syntactic slots of subject, object, etc., the Chinese *ziji* can only be bound to a subject. Consider the following examples:

(13) Lao Wang$_i$ ba ziji$_{i/*j}$ de zhaopian gei-le Lao Li$_j$
LW BA self NOM picture give:PFV LL
LW$_i$ gave self$_{i/*j}$'s picture to LL$_j$

(14) Lao Zhang$_i$ gaosu Lao Chen$_j$ ziji$_{i/*j}$ hui kai che
LZ tell LC self can drive car
LZ$_i$ told LC$_j$ that self$_{i/*j}$ can drive

In view of sentences like the above, it is claimed that *ziji* must be bound to a subject, thus characterized as 'subject-oriented'. In comparison, the English reflexives are freer in their choice of the antecedent within the sentence:

(15) George$_i$ gave Jack$_j$ a picture of himself$_{i/j}$

where 'himself' can find its antecedent either in *George* or *Jack*.

2.4 Long-distance Binding

The other feature that distinguishes Chinese from English in the interpretation of reflexives is long- distance binding. Unlike the case with English reflexives, the antecedent of *ziji* need not be confined to the binding domain as defined by the closest accessible SUBJECT. Instead, *ziji* in an embedded clause can be bound to an NP across as many clause boundaries as the case may be. In other words, the distance between the reflexive and its binder in term of clause boundaries can be greater in Chinese. Consider the following sentences:

(16) [Lao Wang$_i$ shuo [Lao Li$_j$ jiang-guo
LW say LL say
[ziji$_{i/j}$ bu hui kai che]]]
self not can drive car
LW$_i$ said that LL$_j$ said that self$_{i/j}$ doesn't know how to drive

(17) [Lao Wang$_i$ yiwei [Lao Li$_j$ zhidao [Xiao Zhang$_k$
LW think LL know XZ
bu xiangxin ziji$_{i/j/k}$]]]
not believe self
LW$_i$ thought that LL$_j$ knew that XZ$_k$ had no trust in self$_{i/j/k}$

(18) [Lao Wang$_i$ bu xiangxin [Lao Li$_j$ hui shuo
LW not believe LL can say
[ziji$_{i/j}$ de haizi hen ben]]]
self NOM kid very dummy
LW$_i$ didn't believe that LL$_j$ said that self$_{i/j}$'s kid was dummy

In the above sentences, *ziji* embedded in the innermost clause can take the subject in any of the higher clauses as its antecedent -- a phenomenon that is not allowed in English.

Given the above observation, it is clear that the Binding Principles, specifically Principle A, as formulated in (11) fail to provide an adequate account for the interpretation of the Chinese reflexive *ziji*. Whereas the definition of the GC is too restricted to allow for the long-distance binding of *ziji*, no accommodation is provided for the alleged subject-orientation of the Chinese reflexive within the clause boundary.

3. Current Solutions

3.1 Proposals Within the Formalist Paradigm

As Bouchard (1984:4) put it, the central concern of GB is to determine the positions in which different manifestations of NPs can appear. Of all the subsystems that constitute the core of the syntactic component developed within the paradigm, the Binding Principles as outlined above occupy a position of central importance. The fact that Chinese violates the proposed theory in the interpretation of the reflexive *ziji* poses as a problem to the claimed universal validity of the GB framework. The past decade has witnessed tremendous efforts being exerted in the attempt to accommodate within the general GB paradigm the deviant behaviors as displayed by the Chinese reflexive *ziji* in its interpretation, which are shared to varying degrees by reflexives in other languages as well, mainly Japanese (Kuno 1987), Korean (O'Grady 1987, Yoon 1989), and Scandinavian languages such as Icelandic, Swedish, Norwegian, etc.

(cf. Maling 1984, Bremen 1984, Hellan and Christensen 1986, Hellan 1988). The main goal of the endeavor is to account for the diversities displayed by those languages in anaphoric interpretation in such a way that the basic tenets of the Binding Principles, and for that matter, the theoretical thrust of the GB theory, are preserved intact.

So far, there are three major approaches that have been pursued towards the fulfillment of the goal. The first approach is represented by Wang and Stillings (1984), which proposes that the Chinese reflexive *ziji*, together with the Japanese reflexive *zibun* and the Korean reflexive *saki*, represent a new category of anaphoric devices, called 'anaphoric pronoun', which is accompanied by a new binding principle that specifically accounts for its use and interpretation. The second approach is represented by Yang (1983) and Manzini and Wexler (1987), which redefine the notion of the GC to allow for further parametric options. Under the theory of the modified GC, the diversity between Chinese, Japanese, Korean, Scandinavians on the one hand, and English on the other hand is attributed to the difference in the scope of the GC, which is wider and more flexible for the former than for the latter.[4] Huang and Tang (1988), Tang (1989), and Battistella (1989), Cole et al (1990) represent the third approach, which is referred to as the 'Movement Hypothesis' by Xu (1990). In the endeavor to maintain the locality restriction that is imposed by the Binding Principles upon the interpretation of *ziji*, the proponents of the Movement Hypothesis make the Chinese reflexive move cyclically to wherever its antecedent is. Although each of them has proposed different types of movement and conditions of movement, to a certain extent they have succeeded in reconciling the long-distance nature of *ziji* and the locality restriction imposed by the Binding Principles as formulated in standard terms.

3.2 Problems Old and New

While the above proposals have each contributed in their own way towards an account of the interpretation of *ziji* within the overall framework of GB, they have without exception encountered problems.

While offering a solution to peculiarities displayed by reflexives in Chinese and the other similar languages, Wang & Stillings'(1984) theory creates a serious theory-internal problem. In the standard GB framework, the lack of an overt counterpart of PRO[+anaphor, +pronominal] follows as a logical consequence of the interaction of its several sub-systems rather than as a mere accident. If an overt NP is [+anaphor], it has to be ungoverned to avoid the impossible situation in which it is both bound and free in the Governing Category; If it is ungoverned, however, it won't have a case assigner, and will as a result be ruled out by the Case Filter. Hence the lack of an overt NP[+anaphor, +pronominal]. Any suggestion in favor of the birth right of such an overt NP sounds dubious unless

accompanied by rather radical revisions to the other subsystems, which may not seem to be a 'cost-efficient' solution to the others in the field.

Bremen (1984) and Kang (1988) have discussed problems, both theoretical and empirical, that are encountered by the advocates of the second approach. According to that approach, the governing category is parameterized, with different scope for different languages, and for different anaphors in the same language (cf. Yang 1983, Manzini and Wexler 1987, etc.). On the theoretical side, Kang (1988) argues, the parameterization suffers from redundancy in mentioning 'government' at all. If the definition of the GC depends crucially upon such notions as 'having a subject, or an Infl, or a Tense, or a Referential Tense, or a Root Tense', then the notion of government is rendered entirely redundant and irrelevant in determining the local domain for anaphors. For instance, for Icelandic, the category with a Referential Tense is bound to have a governor for the reflexive, and, for Japanese and Korean, the root sentence has a governor for the reflexive without fail, if the reflexive is governed at all. Thus, there is no need for the notion of government in defining the GC for those languages. On the empirical side, the approach cannot accommodate for as much data as it intended to. For instance, the GC for Icelandic is defined, among other conditions, by the presence of Referential Tense (Indicative Mood) instead of the Non-referential Tense (Subjunctive Mood). As observed in Bremen (1984:203), the stipulation works for Icelandic, but fails with the other Scandinavian languages such as Norwegian and Faeroese.

During the past few years, it appears that the Movement Hypothesis in its various versions has attracted more and more adherents. However, this approach also has its own problems. Briefly speaking, the proponents of the Movement Hypothesis have yet to solve two major problems that are generated by the theory.

Firstly, as Xu (1990:3) points out, under the Movement Hypothesis, the Chinese reflexive *ziji*, or the reflexives in the other languages that display similar long-distance binding effects, can move as far as need be, but only at the expense of the validity of the notion of barriers. No barriers as defined in Chomsky (1986b) can block the relation between the anaphor and the antecedent, which can be indefinitely far away and whatever boundaries in between. Xu (1990) argues, quite convincingly, that this approach virtually renders the notion of barriers vacuous, which is otherwise a useful concept in Chinese syntax in the GB framework.

Secondly, the proponents of the Movement Hypothesis have been mainly concerned with accounting for the long-distance effects of the reflexive, with hardly any explanation to subject orientation in the interpretation. Instead, subject orientation is assumed to be a primitive fact that needs no explanation in itself. In fact, subject orientation has been widely cited in the literature of both Chinese

linguistics and general linguistics as a well-established fact about the interpretation of the Chinese reflexive *ziji*, Katada (1991:309) and Thomas (1991:219) being two latest instances. In Huang and Tang (1988), Tang (1989), etc., subject orientation of *ziji* is taken without questioning as a starting point from which the argumentation for the Movement Hypothesis proceeds. Typically, the whole argumentation depends crucially upon subject orientation of the reflexive. As Battistella (1989:993) notes, assuming that Principle A applies at LF, it follows that only the subject will c-command an anaphor in Infl position. However, the crucial point here is that the presumed subject orientation of the reflexive *ziji* cannot be accepted at its face value. There are many cases that *ziji* is coreferential to non-subject antecedents within or outside the clause where it is embedded. Consider the following sentences:

(19) Lao Wang$_i$ ba Lao Li$_j$ suo zai ziji$_{i/j}$ de wuzi li
LW BA LL lock in self NOM room in
LW$_i$ locked LL$_j$ in self$_{i/j}$'s room

(20) Lao Wang$_i$ bei Lao Li$_j$ suo zai ziji$_{i/j}$ de wuzi li
LW PM LL lock in self NOM room in
LW$_i$ was locked by LL$_j$ in self$_{i/j}$'s room

(21) [You ren$_i$ gaosu ta$_j$ [ziji$_{i/j}$ de fangzi zhaohuo le]]
have person tell he self NOM house on:fire CRS
Someone$_i$ told him$_j$ that self$_{i/j}$'s house was on fire

In the above sentences, *ziji* can be coreferential with a non-subject within the same clause, as in (19) and (20), or in the clause higher up, as in (21). In a multi- strata model of generative grammar, such as the current GB framework and its predecessors, most of such examples could be explained away by stipulating that the nonsubject antecedent at issue is a subject at some earlier stage of derivation where the rule of reflexivization applies. As Faltz (1985:82) remarks, however, the validity of such argumentation depends on the productivity and transparency of the syntactic combinations involved. So far as the counterexamples to the putative subject orientation in Chinese are concerned, obviously some are more difficult to explain away than others. For instance, it would be more costly to assign a deeper-level subject status to the object of ba in (19) than to the object of *bei* in (20), even more costly with the object in (21). It remains to be seen how the details are to be worked out to reach the goal.[5] Witness the tendency to reduce the levels of derivation within the Chomskyan paradigm during the past two decades, and we can imagine that it would be increasingly difficult to stipulate as many underlying levels or stages of derivation as needed to explain away those counterexamples.

The functional approach to be offered here provides an alternative perspective to the problems. It starts with examining whether the putative subject

orientation is violated in a principled way, and, if the result is in the positive, it will determine what underlying principles are at work that are responsible for both what has so far been termed subject orientation in the literature and for the regular exceptions to it. As the functional account is developed below, I will demonstrate that the characterization as subject orientation of *ziji* is spurious and both syntactic and non-syntactic factors contribute to the interpretation of *ziji*. What is more important, I will show that underlying the contributing syntactic and nonsyntactic factors is the topicality of the constituents involved that plays a central role in the interpretation of the Chinese reflexive.

Aside from the problems discussed above, no attempt has been made in the formalist literature to account for discourse binding of *ziji*. As will be shown below, the binding of *ziji* at the discourse level can be captured by the same set of principles as needed for sentence-level binding of *ziji*. The account would certainly be more revealing, and more desirable, that explains a wider range of data at no extra cost. That is also what we intend to do with the functional approach to be explicated below.

4. A Functional Account

The previous discussion has revealed the theoretical and empirical problems encountered by the representative formalist approaches in the attempt to capture the characteristics of the Chinese reflexive *ziji* within the GB paradigm. As I will argue below, what lies at the heart of the problems is the fact that the anaphoric interpretation of *ziji* is in the last analysis conditioned by discourse-pragmatic factors that defy characterization in purely structural terms, but lend themselves readily to a functional account. Specifically, I propose that the fundamental factors at work in the interpretation are [+pivot] and [+high topicality]. First, I would like to elaborate on these two crucial notions.

4.1 Definition of pivot and topicality

4.1.1 Pivot

The notion of pivot used here is borrowed from Sells (1987), which is in turn the latest development along the lines initiated by Kuroda (1973), and followed up by Bremen (1984), Maling (1984), Kuno (1987), inter alia. It was first observed that some African languages have a specific type of pronouns which must corefer with the person who utters the sentence that contains the pronoun in question, or with the person whose thought is being reported upon. Such pronouns are hence considered to be 'logophoric', which means 'referring to the speaker/thinker'. The concept of logophoricity was further developed in later publications, sometimes under different labels, such as 'empathy', 'camera angel', 'point of view', etc. The hitherto most detailed analysis of logophoricity is Sells (1987), which maintains that there is no unified notion of logophoricity,

and that instead there are three more primitive 'roles' in discourse, viz. the source, the self, and the pivot.

According to Sells (1987), the source is the one who is the intentional agent of the communication, as exemplified by *Max* in (22):

(22) Max said that Louis loved him$_i$

The self represents the one whose mental state or attitude the content of the proposition describes, as exemplified by *Max* in (23):

(23) That Louise ignored him$_i$ distressed Max$_i$

Finally, the pivot is the one with respect to whose (space-time) location the content of the proposition is evaluated. It is used in a very physical sense, as the 'center of deixis'. 'If someone makes a report with Mary as the pivot, that person is understood as (literally) standing in Mary's shoes.' (Sells 1987:456) It is exemplified by *Max* in (24):

(24) Max$_i$ was reading when Marie came to visit him$_i$

As discussed in Sells (1987), these roles define different discourse environments, depending on the specification of each, namely, whether each role is predicted of a sentence-internal referent or of the external speaker. The tenet of Sells' analysis is that logophoric pronouns will link to some NP in virtue of the fact that it is associated with a particular role, which may differ with different languages, or with different anaphors within the same language. Furthermore, Sells observes that there is some kind of hierarchy or implicational system with the three roles. Internal source implies internal self, which in turn implies internal pivot. The reverse implications do not hold.

With the help of the analytic tools provided by Sells' framework, I maintain that it is pivot that is essential for the use of the Chinese reflexive *ziji*. Consider the following sentences:

(25) Lao Wang$_i$ pai-le ziji$_i$ yixia.
LW$_i$ hit-PFV self$_i$ once
LW$_i$ gave self$_i$ a pat

(26) Lao Wang$_i$ hen gaoxing, yinwei Lao Li$_j$ zuotian
LW very pleased because LL yesterday
zhuanmen gei ziji$_i$ song-lai ji su xianhua
specially for self give-come some bunch flower
LW$_i$ was very happy because LL$_j$ made a special trip
yesterday to bring self$_i$ some bunches of flower

In the above sentences, the referent doesn't have to be the source or the self of the predication to be the antecedent of *ziji*. For example, *Lao Wang* in (25) is neither the source nor the self, as defined above, of the predication P (x,x), yet it binds *ziji*; *Lao Wang* in (26) is the self, but not the source. However, the referent has to be pivot to be binder of *ziji*, as *Lao Wang* is in both (25) and 26).

4.1.2 Topicality

Topicality is defined here as worthiness of a referent to serve as the topic of a comment, whereas topic is defined as what is being talked about. There are a variety of motives that compete and converge to determine selection of a topic or topics out of the group of candidate referents. As a result, these motives can be taken as the criteria against which the topicality of a particular referent is evaluated. There is a very rich amount of literature that discusses the notion and the related phenomena. For the intended purpose in this paper, I will mainly rely upon theories expounded in Bates and MacWhinney (1978, 1982), and Givon (1983, 1984, 1989b).

According to Bates and MacWhinney (1982), the major factors that are at work in selecting topics, or, in my present terms, in determining the topicality of referents, are:

(27) 1. givenness-newness
2. perspective
3. salience

Let's discuss each in turn.

Giveness-newness

This dimension measures the continuity of the referent with the preceding discourse. A given NP is more closely related to the preceding discourse than a new NP, thus standing in better chance of being chosen as a topic. The common forms of its manifestation can be arranged in the form of a hierarchy:

(28) Givenness Hierarchy
pronoun > definite NP > indefinite NP

Perspective

Perspective measures the ease with which the speaker identifies with a certain NP in discourse. More speakerlike elements are easier to be chosen as the topic, thus standing higher in topicality. As extensively reported in the functionalist literature, there are several dimensions along which this closeness-to-ego is assessed (Keenan & Comrie 1977 Bates & MacWhinney 1979, 1982, Hopper and Thompson 1980, Silverstein 1981, Givon 1984, 1989b, Kuno 1987, etc.). Among the most important ones are the following:

(29) Semantic Case Role Hierarchy
agent > experiencer > dative > instrument >
patient > location

(30) Inherent Lexical Content Hierarchy
(Silverstein Hierarchy)
1st p pron > 2nd p pron > 3rd p pron > 3rd p dem >
proper name > kin-term > human & animate >
concrete object > abstract

Salience

It refers to perceptual and attentional vividness or salience. The consensus of opinion in the field is that it is a poorly understood dimension, one that requires a great deal of information about specific situations and about the role of attention in information processing (cf. Bates and MacWhinney 1979, 1982, Bosch 1983, Tomlin 1983, etc.)

According to the above discussion, the topicality of a specific NP is determined by its status along the above dimensions as a combination. The dimensions often converge in the direction of high topicality for a specific referent. For instance, in the prototypical case, the referent that is chosen as a topic (often in the form of a syntactic subject) is one that is a given NP, an agent, an NP encoded by a very ego-close lexical device, and an NP that stands in high salience (whatever it may mean), all at the same time. But those dimensions can also diverge, bringing about a complicated situation of competing value assignments. For instance, the subject can be a new NP, or a non-agent, etc., as a result of interactions of competing motivations. In the interpretation of *ziji*, it is precisely when those dimensions diverge that the characterization in purely structural terms collapse. I will return to the important issue later.

On the other hand, Givon (1983, 1984, 1989b) developed an original methodology to measure quantitatively the topicality of referents in discourse.

Briefly speaking, the topicality of referents is assessed through three kinds of measurements in his framework:

(31)1. Referential Distance (RD) -- in terms of the number of clauses (or elapsed time) from the last occurrence in the preceding discourse

2. Potential Interference (PI) -- in terms of the number of semantically compatible referents within the preceding discourse

3. Topic Persistence (TP) -- in terms of the number of recurrences of the referent in the subsequent ten clauses

While the RD and PI measure the predictability of the referent, the TP measures its importance. The more predictable and the more important a noun is, the more topical it is.

For lack of space, I don't intend to compare the methods of measurement proposed by Bates & MacWhinney and Givon respectively. Suffice it to say that the two systems are complementary to each other in measuring basically the same discourse-pragmatic property. Where clues from Bates and MacWhinney's framework to assess the value along some parameter are insufficient, for instance, to assess the salience of referents, Givonian measurements provide some remedy. Later in my exposition, I will make reference to both where appropriate.

4.2 Conditions for being antecedent of *ziji*

I claim that [+pivot] and [+topicality] are the two fundamental factors that regulate the interpretation of *ziji*. To be qualified as the antecedent of *ziji*, a referent has to be pivot, and stand high in topicality as defined in Paragraph 4.1. The characterization will not only capture what has been discussed so far on the interpretation of *ziji*, but also provide a coherent and natural account for the new revelations to be made below. Specifically, it will explain both subject orientation and non-subject orientation, sentence binding and discourse binding, and long-distance binding together with its various effects. At the same time, it will predict correctly when a referent cannot be the antecedent of *ziji*.

Let's first discuss the subject orientation of *ziji*, with special attention going to how topicality as a regulating factor is manifested in syntactic and nonsyntactic terms.[6]

4.3 Subject-orientation re-examined

4.3.1 Different views on the notion of subject

Of the two features discussed in the literature as characteristic of the interpretation of *ziji*, subject orientation plays a vital role in the whole argumentation for the Movement Hypothesis within the GB paradigm. In the theory of Battistella (1989), for example, reflexives in Chinese move in LF from argument position to Infl, which provides an explanation for the subject orientation in addition to the long-distance binding of *ziji*, under the assumption that the antecedent for a reflexive must c-command the reflexive at LF. Since only the subject of a clause c-commands Infl, the subject is the only possible antecedent for the reflexive (Battistella 1989:2).

The crucial difference between the functional approach proposed here and the formalist approach starts with the interpretation of the notion of subject. In the formalist paradigm, the notion of subject is characterized purely in terms of the structural configurations of the constituents involved. It is taken to be an abstract syntactic element that is defined within an autonomous syntactic component of the grammar independent of any semantic and/or pragmatic underpinnings. Those who work within a functional paradigm, on the other hand, assume a different view. They hold that grammatical elements such as subjects are devices whose basic role is to encode the important and recurrent functions of language as means of communication. If the raison d'etre of grammar is to serve and facilitate the communicative tasks of language, it is only to be expected that the grammatical form is motivated, conditioned, or constrained by the function it serves, although often in ways so intricate that the relationship between the two is far from obvious without meticulous in-depth investigations.[7]

On the basis of the ample evidence that has been reported in the literature of functional linguistics, I take (32) and (33) to be statements that are valid on both theoretical and empirical grounds:

(32) In basic sentences, the prototypical subject refers to an agent and is the NP that stands highest in topicality along the other semantic and discourse-pragmatic dimensions

(33) Topicality is a pragmatic notion defined as worthiness of being the theme about which an assertion is made

The above statements maintain that unless there are other concurrent counteractive factors, subject encodes the NP with the highest topicality. Since topicality is a matter of degree, distinction is also made between 'primary topic', 'secondary topic', etc.(cf. Givon, 1984, 1989b), which are correlated with different syntactic slots in prototypical situations, as schematized below:

(34) Hierarchy of Topicality-encoding Syntactic Devices
Subject > Direct Object > Other

While the subject encodes the primary topic, the direct object encodes the secondary topic. Unless otherwise indicated, topic without a premodifier usually refers to the primary topic. For a similar account, see the Accessibility Hierarchy expounded in Keenan and Comrie (1977).

The prototypical situation obtains when the syntactic factor converges with the factors along the other dimensions as discussed in Paragraph 4.1, which means that the subject is also the NP that stands high along the other hierarchies. In such cases, the subject is taken to be the grammaticalized topic. When the factors involved diverge, on the other hand, we resort to various language-specific syntactic devices to accommodate the situation. For example, in English there are passivization, topicalization, left-dislocation, etc., the major function of which is to accommodate the situation where the above topicality-indicating factors do not converge.

4.3.2 Subject antecedent and nonsubject antecedent

Given the background on the differing interpretation of the notion of subject, let's scrutinize the subject orientation of *ziji*.

The formalist accounts of the subject orientation of *ziji* actually have made two presumptions throughout their discussion of the issue:

(35) 1. There is a fully-fledged syntactic notion of subject in Chinese, as in English.

2. The interpretation of *ziji* depends wholly upon the structural relationships that obtain between *ziji* and its potential antecedent. *Ziji* can only take a subject as its binder.

I find both problematic. Whereas a subject is a full-fledged syntactic notion in English, as can be tested with subject-verb agreement, Equi, raising, etc., it is far less certain that the same obtains in Chinese. On the contrary, there is plenty of evidence that points to the opposite. For want of space, I will leave the issue here (for a critical examination of the topic, see LaPolla 1990). For the sake of convenience, the term of subject is still used here, only to refer to no more than the preverbal NP in the NP VP configuration.

My major concern relates to the second presumption. Following the discussion of the two differing views on the notion of subject, it is time for us to have a closer scrutiny of what has so far been referred to as subject orientation of

ziji. The validity of the second presumption in (35) is an empirical question that can be subjected to examination against data. The examination will resolve which one of the following two possible situations conforms to the empirical facts:

(36) *Ziji* is strictly bound to the closest accessible SUBJECT, which is defined in terms of structural configurations, and variations of the nonstructural factors with the subject or other NPs in the sentence do not affect the reflexive interpretation as a principle

(37) The variations of those semantic and pragmatic factors affect the interpretation of *ziji* in such a regular way as to suggest that it is in the interaction of the syntactic and nonsyntactic factors, instead of by the syntactic factor alone, that the interpretation of the reflexive is determined.

What is at issue here is whether and how the interpretation of *ziji* is affected by semantic and pragmatic factors surrounding the subject and other NP constituents in the sentence. As will be demonstrated below, structural constraints may be overridden by non-structural factors in a principled way. It will be established that (37), not (36), accords with the empirical facts.

The functional approach predicts that the antecedent of *ziji* has to be pivot and stand high in topicality as realized along the syntactic and nonsyntactic dimensions. If it stands comparatively high in topicality, it does not need to be a subject to be the antecedent of *ziji*. The situation when a non-subject stands comparatively high in topicality is ascribed to each of the following two contributing factors:

(38) 1. In spite of its structural encoding, the subject stands rather low in topicality as assessed along the relevant nonsyntactic dimensions, making a nonsubject comparatively high in topicality

2. The nonsubject is both in a syntactic slot that typically encodes high topicality, and is a referent high in topicality manifested along the nonsyntactic dimensions

Let's examine what effects it has on the interpretation of *ziji* when the above situation obtains. First, let's consider the situation described by (38).1.

The subject stands lower in topicality when it is a nonagent and/or when it is nongiven or encoded by lexical devices of low topicality. Examples are given below:

(39) Lao Wang$_i$ bei Lao Li$_j$ suo zai ziji$_{i/j}$ de wuzi li
LW PM LL lock in self NOM room in
LW$_i$ was locked by LL$_j$ in self$_{i/j}$'s room

(40) Haizimen$_i$ dou you ta$_j$ dai dao ziji$_{i/j}$
kids all PM he take to self
de gongsi qu le
NOM office go CRS
All the kids$_i$ were taken by him$_j$ to self$_{i/j}$'s office

(41) You ren$_i$ ba Lao Li$_j$ guan zai
have person BA LL lock in
ziji$_{i/j}$ de wuzi li
self NOM room in
Someone$_i$ locked LL$_j$ in self$_{i/j}$'s room

(42) Bieren$_i$ wen ta$_j$ [ziji?$_{i/j}$ de taitai
others ask he self NOM wife
lai-le meiyou]
come:PFV not
Others$_i$ asked him$_j$ whether self?$_{i/j}$'s wife had come

(43) Mou ren$_i$ zuotian jinggao Lao Wang$_j$
some person yesterday warn LW
[ziji*$_{i/j}$ de shenming anquan zheng shoudao weixie
self NOM life safety DUR suffer threat
Someone$_i$ warned him$_j$ yesterday that self*$_{i/j}$'s life was in danger

In (39) and (40), the subject slot is occupied by a nonagent, while the agent appears as an oblique object. In (41), (42), and (43), on the other hand, the subject is either nongiven or lexically encoded in terms of low topicality devices. The lowering of topicality of the subject correlates with the availability of a nonsubject antecedent for *ziji* in the sentence. In the above examples, *ziji* can be, and sometimes must be, coreferential with a nonsubject that stands high in topicality along the nonsyntactic dimensions.

Next, let's consider the situation described by (38).2. It has been widely attested across languages, including Chinese, that some nonsubject syntactic slots are used to encode NPs that stand in high topicality as characterized by its main semantic and discourse-pragmatic features, particularly by givenness (continuity). The most noticeable of such syntactic positions are the possessive of the subject (Kuno 1986, Deane 1987, etc.), the direct object (cf. secondary topic in Givon 1984, 1989, inter alia) and, specifically for Chinese, the *ba* object (Li and Thompson 1981, inter alia).[8] In accordance with my functional characterization of the interpretation of *ziji*, the NPs that are found in those nonsubject yet high-topicality encoding positions should compete well for the antecedent of *ziji*. The

prediction is confirmed by the data. Consider the following sentences:

(44) Lao Li$_j$ de siren yishen$_j$ tixing ta$_i$
LL NOM private doctor remind he
[chaoshi de difang dui ziji$_{i/??j}$ de jiankang buli]
humid NOM place to self NOM health bad
LL$_i$'s private doctor$_j$ reminded him: that humid places are bad for self$_{i/??j}$'s health

(45) Ta$_i$ de ji ge haizi$_j$ dou bu yuanyi
he NOM several CL kid all not wish
jie ziji$_{i/*j}$ de ban
succeed self NOM work
None of his$_i$ several kids$_j$ wants to take over self's$_{i/*j}$ work

In the above sentences, *ziji* can be, or must be, coreferential with a referent that is the possessive in the subject phrase. Furthermore, consider the following sentences where *ziji* can take a direct object or a BA object as its antecedent:

(46) Mishu$_i$ tongzhi Lao Wang$_j$ [dongshiju$_k$
secretary notify LW board:of:directors
jiang yu xia xingqi taolun ziji$_{i/j/k}$ de fang'an]
will in next week discuss self NOM plan
The secretary$_i$ notified LW$_j$ that the board of directors$_k$ will discuss self$_{i/j/k}$'s plan next week

(47) Tamen$_i$ ba diren$_j$ da-hui ziji$_{i/j}$ de laojia
they BA enemy hit-back self NOM home
They$_i$ drove the enemy$_j$ back self$_{i/j}$'s home

From the above examples, we can see that it is precisely when one of the conditions in (38) obtains that *ziji* can be coreferential with a nonsubject. The nonsubject orientation of *ziji* is even more conspicuous when the two situations described in (38) obtain concurrently, viz., when both the subject stands comparatively low, and one of the nonsubjects stands high in topicality by the criteria stated earlier. It is most clearly illustrated by the following contrasting examples:

(48)a. Ta$_i$ ba ji ge ren$_j$ suo zai ziji$_{i/?j}$ de wuzi li
he BA several CL person lock in self NOM room in
He$_i$ locked several people$_j$ in self$_{i/?j}$'s room

b. Lao Wang$_j$ ba Lao Li$_j$ suo zai ziji$_{i/j}$ de wuzi li
LW$_i$ locked LL$_j$ in self$_{i/j}$'s room

c. Ji ge ren$_i$ ba ta$_j$ suo zai ziji?$_{i/j}$ de wuzi li
Several people$_i$ locked him$_j$ in self?$_{i/j}$'s room

d. You ren$_i$ ba ta$_j$ suo zai ziji??$_{i/j}$ de wuzi li
have person BA he lock in self NOM room in
Someone$_i$ locked him$_j$ in self??$_{i/j}$'s room

As evident from the above sentences, with the structural configurations of the constituents remaining constant, changes in topicality realized along the nonsyntactic dimensions play a decisive role in the availability of a nonsubject and/or a subject antecedent for *ziji*.[9]

On the other hand, it must be noted that it is very difficult to find examples in which *ziji* can be construed as coreferential with referents assuming syntactic roles which are typically for referents of low topicality, e.g. object in prepositional phrase other than the *ba*- or *bei*-like constructions, possessive in the object NP, etc. Let's consider the following examples:

(49) Ta$_i$ xiang Xiao Wang$_j$ jieshi-le ziji$_{i/*j}$ de jihua
he to XW explain-PFV self NOM plan
He$_i$ explained to XW$_j$ self$_{i/*j}$'s plan

(50) Lao Li$_i$ gaosu Xiao Wang$_j$ de didi
LL tell XW NOM younger:brother
[ziji$_{i/*j}$ meiyou kao jige]
self have:not exam pass
LL$_i$ told XW$_j$'s brother that self$_{i/*j}$ didn't pass the exam

(51) Ta$_i$ songgei Xiao Wang$_j$ yi ben [ziji$_{i/*j}$ xie de] shu
he give XW one CL self write NOM book
He$_i$ gave XW$_j$ a book that was written by self$_{i/*j}$

The above examples illustrate that not all nonsubject referents can be the antecedent of *ziji*. Only those that are independently attested to stand high in topicality along syntactic, semantic and pragmatic dimensions may be candidate antecedents of *ziji*, especially when the subject concurrently stands low in topicality by the nonsyntactic criteria.

4.3.3 High topicality oriented rather than subject oriented

By now, it has been established through the above scrutiny that the following relationship obtains between the interpretation of *ziji* and the topicality status of the NP involved:

(52) 1. When subjects stand comparatively low in topicality in spite of the syntactic slot it occupies, i.e., when the NP is low in topicality along the nonsyntactic dimensions, it is possible, and sometimes more natural, to have a nonsubject as the antecedent of *ziji*.

2. When nonsubjects also stand high in topicality along the syntactic, semantic, and discourse-pragmatic dimensions as independently attested, they can also be the antecedent of *ziji*.

The results reported in (52) provide considerable insight into the relationship between the syntactic factor and the nonsyntactic factors with respect to topicality as a regulating condition in the interpretation of *ziji*. In the above explication of the functional approach to *ziji*, I have maintained that topicality, together with the notion of pivot, plays a decisive role in the interpretation of the reflexive. At the same time, I have also shown how this pragmatic value is manifested through syntactic, semantic, and discourse-pragmatic encodings. From the above discussion, we conclude that syntax is the most important means by which the topicality of NPs is encoded. *Ziji* can hardly be coreferential to an NP in a syntactic slot that typically encodes NP of low topicality, as exemplified in (49), (50) and (51). At the same time, it has been extensively attested that, in addition to the subject, there are some other syntactic slots that typically have NPs of high topicality, as exemplified by (44), (45), (46) and (47). Within the confines of syntax, we see the conditioning effects of those semantic and discourse-pragmatic factors which also encode this important feature of topicality in ways as represented in the hierarchies in (28), (29), and (30). As corollaries of the above analysis follow two claims concerning the role of syntactic and nonsyntactic factors in the anaphoric interpretation of *ziji*. First, instead of being the sole determinant of the anaphoric interpretation of *ziji*, the syntactic factor acts as one of the factors, albeit the most important of them, that contribute to the interpretative process. Second, it is not the structural configuration per se, but the discourse- pragmatic information of topicality that is encoded in it that is really at work in the whole mechanism. The first claim implies that, to a certain extent, the syntactic factor can be overridden by nonsyntactic factors in the interpretation of *ziji*, while the second predicts that it is only when the syntactic and nonsyntactic factors interact to enhance the topicality of a nonsubject and/or lower the topicality of the subject that subject orientation of *ziji* is violated. Both accord well with the observed data reported here.

To summarize, it has been observed that it is precisely when the subject ceases to be the only referent that stands indisputably highest in topicality that *ziji* may be coreferential with a non-subject in the sentence. Equally significant is the observation that the nonsubject antecedent of *ziji* in such situations invariably stands high in topicality by criteria that have been independently established across languages in general, and for Chinese in particular. Those observations and the ensuing discussions strongly suggest that, when *ziji* is bound to a

syntactic subject, the interpretation of the reflexive is actually not oriented towards the subject per se as an autonomous, structural constituent, but to the discourse-pragmatic underpinning of high topicality that is encoded in the specific slot. In other words, the interpretation of *ziji* is in the last analysis high topicality oriented rather than subject oriented.

All the data that are previously subsumed under subject orientation, together with the current revelation that *ziji* can be coreferntial with nonsubject, lend themselves to a coherent and natural explanation under the functional theory expounded here that depends crucially upon the cognitive-functional notion of topicality. First, what has been cited as supporting evidence for the subject orientation of *ziji* is explained by my theory in a way that is just as effective, but more revealing and comprehensive. It falls out as a natural consequence of the fact that the subject in unmarked cases is by default the NP that stands highest in topicality in the sentence. When the semantic and pragmatic features encoded by a prototypical subject, specifically agent and givenness, are disassociated from the syntactic slot in marked cases, and/or when there is a competing nonsubject referent that has been independently established as also standing high in topicality, *ziji* may be construed as coreferential with the nonsubject.

4.4 Discourse Binding of *ziji*

Under this theory, discourse binding of *ziji* also receives a coherent and natural explanation. First, consider the following examples:

(53)a.Lao Wang$_i$ ne,
LW TM
b. fumu$_j$ zhu zai Reben
parents live in Japan
c. gege$_k$ ye zai Reben,
brother also in Japan
d. ziji$_{i/*j/*k}$ mingnian ye yao dao Reben qu
self next:year also want to Japan go
a. As for LW$_i$,
b. (his) parents$_j$ live in Japan,
c. (his) brother$_k$ also lives in Japan,
d. self$_{i/*j/*k}$ will also go to Japan next year

(54)a. Ta$_i$ tang-le hao yihui,
he lie:PFV quite while
b. zhe cai ding-le shen,
then only calm:PFV spirit
c. erqie fachu guanyu ziji de sixiang lai,
also give:out about self NOM thought come
d. bai kui bai jia de ren$_j$ mingming dao le,
white helmet white armor NOM people obviously arrive CRS
e. bing bu lai dazhaohu,
but not come greet
f. ban-le haoduo dongxi,
remove:PFV many thing
g. you meiyou ziji$_{i/*j}$ de fen
but not:have self NOM share

a. Only after he [Ah Q]$_i$ had been lying down for some time
b. did he feel calm enough
c. to begin thinking how this affected him.
d. The men in white helmets and white armour$_j$ had evidently arrived,
e. but they had not come to call him;
f. they had taken away many things,
g. but there was no share for self$_{i/*j}$.'

(Lu Xun: *The true story of Ah Q*)

In the above two paragraphs, the antecedents of *ziji* are not in the same sentence as the reflexive. Rather, they are topics of the whole discourse paragraph that are across not only clausal, but also sentential boundaries. When assuming the form of a referent instead of a schema (see van Dijk 1980, Reinhart 1981, etc. for the distinction), the discourse topic stands very high in topicality in accordance with all the criteria that have been established so far in determining the topicality of a referent. In the words of Bates and MacWhinney (1982:199), 'because discourse is a cooperative enterprise we must struggle to provide continuity and to make comments only about information that is already available to both speaker and hearer.' The discourse topic, by definition, is a referent that is already available to the participants of communication. Furthermore, following Givon (1983, 1984, and 1989b), a discourse topic scores high in topicality due to its strong topic persistence measured in terms of the number of recurrences of the referent in subsequent text. Thus, the referent that serves as the discourse topic stands high in topicality both anaphorically and cataphorically, which makes it an highly plausible candidate as the antecedent of *ziji*.[10]

In contrast to the functional approach that explains the discourse binding of *ziji* with resort to the same set of principles as for sentence binding, the formalist approach so far has nothing to say in this regard.

4.5 Long-distance binding and related effects

4.5.1 Long-distance binding

Given the discourse binding of *ziji*, what has been referred to as long-distance binding of the Chinese reflexive falls out naturally. If this anaphor can find its antecedent across sentential boundaries, it is only to be expected that it can be bound to a referent across clausal boundaries --- so long as the latter is pivot and high in topicality.

In addition to what has been discussed above under long distance binding of *ziji*, some further effects for the interpretation of *ziji* have been reported in the literature (Huang and Tang 1988, Battistella 1989, Battistella and Xu 1990, etc.). They are presented as following:

(55)A. Blocking effect, whereby long-distance binding of *ziji* is possible only in case all c-commanding subjects agree in person and number
B. Maximal-clause effect, whereby *ziji* tends to be bound to the subject of the root clause
C. Minimal distance effect, whereby *ziji* tends to be bound to the closest accessible subject

What I would like to demonstrate below is how the effects that have been attested in the literature in connection with long distance binding of *ziji* receive a coherent and natural explanation under my theory.

4.5.2 Blocking Effects

First let's consider the Blocking Effects. It has been observed that long-distance binding of *ziji* is possible only when the potential intervening antecedents agree in person, and less importantly, in number. For example:

(56) Ta_i zhidao wo_j dui $ziji_{*i/j}$ meiyou xinxin
he know I to self have:not confidence
He_i knew that I_j had no confidence in $self_{*i/j}$

In (56), the long-distance binding of *ziji* to the root subject third-person ta is blocked by the intervening first-person subject *wo*. The formalist approaches have proposed complicated indexing devices in connection with cyclic rules to capture both the Blocking Effects and the long-distance binding of *ziji* (cf. Tang 1986, 1989, Huang and Tang 1988, Battistella and Xu 1990, etc.). In essence, language-specific rules are stipulated for Chinese which allow the binding of *ziji* in its governing category to apply cyclically so that an embedded occurrence of *ziji* can be successively recoindexed to higher subjects until finally reaching the

root- subject antecedent. The features of *ziji* are generated at D-structure and may not be changed later. There is a checking procedure that examines the features of *ziji* and those of its antecedents on each cycle. If *ziji* fails to agree with its antecedent on any cycle, the derivation will be ruled out.

Xu (1990) disagrees with the analysis along the above lines, pointing out that, first of all, the agreement in person and number is not a strict requirement. Consider the following sentences:

(57) Ta_i zhidao [$tamen_j$ dui $ziji_{i/j}$ meiyou xinxin]
he know they to self have:not confidence
He_i knew that $they_j$ had no confidence in $self_{i/j}$

(58) Ta_i pa wo_j [chaoguo $ziji_{i/*j}$]
he fear I surpass self
He_i was afraid that I_j might surpass $self_{i/*j}$

(59) $Zongtong_i$ qing wo_j [zuo zai $ziji_{i/*j}$ de pangbian]
president ask I sit at self NOM side
$President_i$ asked me_j to sit by $self_{i/*j}$'s side

In spite of disagreement in number, *tamen* in (57) doesn't block the possible binding of *ziji* to *ta*, as predicted by (55)A. In the same vein, *wo* in (58) and (59) doesn't block the binding of *ziji* to *ta* and *zongtong* although they are of different person. Intuitively and insightfully, Xu (1990) concludes that what are involved here may be discourse factors, and a purely grammatical approach like the cyclically indexing rule is an unnecessary complication rather than an adequate description.

The insightful intuition of Xu is borne out by Yoon (1989), which offers a natural explanation for the Blocking Effect of the Chinese reflexive *ziji* by depending crucially upon the notion of logophoricity. She reasons that the blocking effect arises as a result of conflicting pivots when binding *ziji* and its antecedent operates across an intermediate antecedent of different person. Take (56) for illustration. With a first person *I* in the sentence, the external speaker cannot pretend to identify with somebody else in the sentence, since *I* itself is the external speaker. The binder of *ziji* has to be [+pivot], which means that the reporter must be understood as literally standing in that person's place. Now, if *ziji* is bound to *ta* in (56), the awkward situation results in which the same person stands in two different places at the same time (cf. Yoon 1989:491).

On the other hand, since what is referred to as the Blocking Effect is basically an issue based upon pragmatic judgment, it is only to be expected that it is not as robust as assumed in the literature. It relaxes with NPs in different numbers but in the same person, as demonstrated by (57). Furthermore, the

Blocking Effect can be canceled, or overridden, by other co-occurring factors, as is the case with (58) and (59). Logically, it is very implausible for someone to surpass oneself or sit beside oneself. At the same time, *ziji* must be coreferential with a referent nearby in the text. The two factors combined make the root subject the only choice.

4.5.3 Maximal Clause Effect and Minimal Distance Effect

Next, let's consider the other two kinds of effects, the Maximal Clause Effect and the Minimal Distance Effect. As compared with the former, the latter is not as obvious. For the sake of convenience, the two are discussed together here.

The Minimal Distance Effect refers to the tendency for *ziji* to be bound to the closest accessible subject, while by the Maximal Clause Effect *ziji* tends to be bound to the subject of the root clause. These two kinds of effects work in concert towards excluding the subject of the medial clause as the plausible binder of the embedded *ziji*. For instance, it is reported that speakers tend to choose either *Zhangsan* in the root clause or *Wangwu* in the innermost clause, but rarely *Lisi* in the medial clause, as the binder of *ziji* (cf. Battistella and Xu 1990):

(60) Zhangsan$_i$ yiwei [Lisi$_j$ zhidao [Wangwu$_k$ bu xiangxin ziji$_{i/?j/k}$]]
Zhangsan think Lisi know Wangwu not faith self
Zhangsan$_i$ thought that Lisi$_j$ knew that Wangwu$_k$ had no faith in self$_{i/?j/k}$

Suggestions are found in the literature to accommodate the two kinds of effects, especially the Maximal Clause Effect, by further parameterizing governing category and making the root clause a default one (cf. Tang 1989, Battistella and Xu 1990, etc.).

In my view, however, it is again a case that is best dealt with via a functional approach. I would like to show that it is the difference in topicality with the subjects in the root clause and the minimal clause on the one hand, and the subject in the intermediatory clause on the other hand, that is responsible for what are referred to as the Maximal Clause Effect and Minimal Distance Effect.

As compared with the intermediatory subject, the minimal subject and the root subject both stand higher in topicality, albeit each ascribed to different causes. The minimal subject scores high in topicality because of its minimal distance to the *ziji*, which also means minimal potential interference between them. On the other hand, the root subject stands high in topicality in much the same way as the discourse topic. Taken in isolation, a sentence is a piece of independent, self-coherent discourse (cf. Zribi-Hertz 1989). By its very position at the beginning of the sentence, or rather at the beginning of the discourse, the

root subject is the referent that is most plausible to serve concurrently as a discourse topic. In other words, if we assess the topicality of the three kinds of subjects by Givonian measurement, we will find that the minimal clause subject scores high in terms of referential distance and potential interference, whereas the maximal clause subject scores high in terms of topic continuity. In comparison, the subject in the intermediatory clause lacks the special status accorded to the root subject on the one hand, and on the other hand scores lower than the minimal subject in terms of referential distance and potential interference.

Once again, however, it has to be pointed out that, like Blocking Effect, the Maximal Clause Effect and Minimal Distance Effect are both tendencies rather than rigid grammatical rules, as attested in various formal and informal surveys (cf. Battistella and Xu 1989, Xu 1990). The situation fits in well with what is predicted under the functional theory, given the nature of topicality assessment as discussed above. On the other hand, it casts further doubt upon the validity of any explanation that is exclusively based upon structural configurations of the elements involved.

4.6 Summary

The goal of the above discussion has been twofold: First, to identify the roles played by syntactic and nonsyntactic factors respectively in the anaphoric interpretation of *ziji*. Second, to establish the fact that there is a functional core which underlies all the contributing syntactic and nonsyntactic factors in their interaction with regard to the interpretative process.

In my view, the functional approach expounded here offers an elegant account of all the major characteristics displayed by the Chinese reflexive *ziji* in its interpretation. We have compared the representative formalist treatments and the functional approach in the characterization of what have been taken as the special as well as the general effects displayed by the anaphoric interpretation of *ziji*: Subject orientation and non-subject orientation, sentence binding and discourse binding, long-distance effect, blocking effect, maximal clause effect and minimal distance effect. All of them can be accommodated in a coherent and natural way in the present functional theory that is based upon two cognitive-functional notions, i.e. pivot and high topicality.

5. Concluding Remarks

Alongside the representative formalist treatments of the interpretation of *ziji*, this paper offers a functional alternative that may yield better results in terms of descriptive and explanatory adequacy. The results should follow as a corollary of the finding reported here that, in the last analysis, the interpretation of *ziji* is a discourse-pragmatically controlled phenomenon that is more susceptible to a cognitive-functional characterization than to an approach couched purely in terms

of the structural configurations of the constituents involved. All the hitherto revealed characteristics concerning the interpretation of *ziji*, including those recalcitrant to formalist accounts, lend themselves readily to a coherent and natural explanation under the present theory which is based crucially upon two cognitive-functional notions, pivot and topicality.

From this conclusion arise some implications of general theoretical interest. While raising some questions to the effectiveness of the Binding Principles as they apply to Chinese, this paper has demonstrated that a functional perspective can achieve some descriptive and explanatory success at least with the reflexive *ziji* in Chinese. If further investigations confirm that this functional perspective is a viable alternative to the subject, it appears that we are faced with the following two options if we attempt at an cross-linguistic account for the use of reflexives.

The first option is to maintain that the interpretation of *ziji* in Chinese, and, reflexives in other languages that display similar characteristics simply cannot be captured by the Binding Principles in their present formulation, which are valid grammatical rules only with languages such as English. The interpretation of *ziji*-like reflexives is in the last analysis discourse-pragmatically controlled. Languages can be categorized according to whether the interpretation of its reflexives is basically syntactically or discourse-pragmatically controlled, each with its own conditioning mechanisms and theoretical ramifications.

The second option is to assume that the same set of discourse-pragmatic principles as expounded here applies to all the languages, although it may be grammaticalized to various degrees with different languages. For languages like Chinese, discourse-pragmatics plays a conspicuous role in the anaphoric resolution of reflexives, relegating syntactic factors to the status of subservience. On the other hand, to the extent that notions such as subject and object are fully grammaticalized entities in languages like English, the interpretation of anaphoric devices may be captured in terms of structural configurations of the constituents involved. That, however, by no means implies that the same set of nonsyntactic factors is not operative with the latter languages. As amply attested in the literature (Reinhart 1983, Kuno 1987, Levinson 1987, Zribi-Hertz 1989, inter alia), semantics and pragmatics continue playing an very important role with these languages, although less decisive than the case with Chinese. Following this approach, an account of anaphoric devices cross-linguistically starts with determining the extent of grammaticalization of the same set of semantic and discourse-pragmatic principles in different languages.

In view of the findings reported here for Chinese, as well as those reported for English by people working along similar cognitive-functional lines, particular those by Bickerton (1975), Bolinger (1979), Kuno (1987), inter alia, I tend to opt for the second approach.

Notes

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1 In addition to these NP reflexives, there is also a verbal reflexive, albeit less productive in Modern Chinese than in Classical Chinese, whereby the verb is modified to signal that it is being used reflexively. The morpheme that is usually employed for the purpose is *zi*, as in *zisha* 'commit suicide', *zikua* 'sing one's own praise', *zijian* 'recommend oneself', etc., which are all intransitive verbs with a reflexive meaning. Logically, the clause that contains a transitive verb with a NP reflexive as object expresses the same content as the clause with a verb that is modified, or detransitivized by a verbal reflexive, as exemplified by the following:

(1) Lao Wang sha le ziji
LW kill PFV self
(2) Lao Wang zisha le
LW commit:suicide PFV

The situation can be diagrammatically represented as:

$P(x,x) = P_R(x)$

For a cross-language treatment of the phenomena, see Faltz (1985).

2 I use the following abbreviations in the glosses of the example sentences: BA=*ba*, CL=Classifier, CRS=Currently Relevant State, DUR=Durative Aspect, MP=Mood Particle, NOM=Nominalizer, PFV=Perfective Aspect, TOP=Topic, DAT=Dative. For detailed definitions of the above terms, see Li and Thompson (1981).

3 Although the unavailability of the English reflexives for Possessive is usually considered to be a historical accident, it throws much light into the difference in pronominality of the reflexives in English and Chinese. According to the criteria spelled out in Sugamoto (1987), English reflexives such as *himself, themselves*, etc. stand higher in pronominality than the Chinese reflexive *ziji*. For details, see Sugamoto (1987).

4 In addition to the Governing Category, Manzini and Wexler (1987) also parameterizes the notion of proper antecedent to account for crosslinguistic variation in the binding theory. The settings for the two multivalued parameters are as follows:

(1) γ is a governing category for α iff γ is the minimal category which contains α and has
  a. a subject; or
  b. an Infl; or
  c. a Tense; or
  d. a 'referential' Tense; or
  e. a 'root' Tense.
(2) A proper antecedent for α is
  a. a subject β; or
  b. any element β.

5 Faltz (1985) observed that there are at least three language types for which subject orientation of reflexives may be problematic, strictly ergative languages, topic languages, and so-called split-subject languages. He provided a brief account how the examples of nonsubject orientation in his data are explained way. For instance, using Japanese as a representative of topic languages, he argues that *Satoo* in the following sentence is actually a subject in spite of its surface marking as a topic (Faltz 1985:80):

satoo$_i$	wa	tanaka$_j$	ni	zibun$_{i/*j}$	no-koto-tuite	hanasita
Sato	TOP	Tanaka	DAT	self	about	speak:past

Sato talked to Tanaka about himself

Faltz (1985), however, didn't mention situations discussed here, where *ziji* is coreferential to a nonsubject and nontopic element within or outside its clause.

6 Jackendoff (1972) is among the few who first observed that the interpretation of reflexives is regulated by non-syntactic factors. He proposed a Thematic Hierarchy (TH) as follows:

(1) Agent
(2) Locative
(3) Theme

and his so-called TH Condition on Reflexives states that a reflexive may not be higher on the TH that its antecedent. Thus, (1) is ruled out:

(1) *John$_i$ was deceived by himself$_i$

However, just as Cornish (1986:42) argues, this sentence cannot be marked as ungrammatical (or more correctly, asemantic) as a decontextualized, system sentence for its status can only be assessed relative to some discourse context, a context which must include stress and intonation markings. It becomes perfectly acceptable in contexts where the reduced pitch and stress levels characteristic of pronouns are uncalled for, as in answer to (2), when *himself* would be 'accented' or to (3), when *himself* would be given a contrastive accent (prefixed by NO!):

(2) Who was John deceived by, do you know?
(3) It must have been Bill who deceived John.

The case provides a piece of supporting evidence from English for the claim that the antecedent must stand higher in topicality than the the reflexive which is either demonstrated through the difference in topicality displayed by various syntactic slots in unmarked situations, as when (1) is taken in neutral circumstances, or with the help of prosodic means in marked situations, as when (1) is in answer to (2) or (3).

7 Here I quote Silverstein (1987:130) as a pertinent and perceptive characterization of the situation 'There is, at present, no question of 'reducing' all of linguistic structure to semiotic-functional principles of a more general, or even nonlinguistic sort. Indeed, the very fact that our formulable principles, as will be seen, make reference to the grammatical categories of the morphosyntactic Noun Phrase prevents us from doing away with the distributional structure of referential-and-predicational language. Morphosyntactic structure is, at present, something that cannot be derived in toto from semiotic or other principles. However, it is the case that semiotic-functional principles seem to be central to any account of what one might call the 'content' of grammatical categories, as these are implicit in, and the relevant anchoring constraints on, morphosyntactic organization of language. And the more we can show that interacting morphosyntactic patterns of a wide variety of types have such content as the constant they seem to be coding, regardless of the (orderly) variations in formal organization across languages, the more will it become apparent that semiotic-functional principles must play a central, not peripheral, role in understanding specifically linguistic structure and the less will specifically linguistic structure appear to be autonomous form, of which we cannot inquire into the raison d'etre.'

8 '*Ba*' is a grammatical particle in Chinese whose major function is to introduce a preposed direct object in the so-called 'disposal construction'. The object preposed to the left of the verb with the help of *ba* is usually an NP of definite reference that has already been established in discourse. For details, see Li and Thompson (1981).

9 Actually, the similar situation is reported for English as well in Kuno (1987), as summarized by Van Valin (1990:205). Consider the following contrasting sentences:

(1) a. John$_i$ talked to Bill$_j$ about himself$_{i/j}$.
b. One of the students$_i$ talked to Bill$_j$ about himself$_{i/j}$.
c. A student$_i$ talked to Bill$_j$ about himself$_{i/j}$.
d. A passerby$_i$ talked to Bill$_j$ about himself$_{?i/j}$.
e. Someone$_i$ talked to Bill$_j$ about himself$_{??i/j}$.
(2) a. Bill$_i$ talked to one of the students$_j$ about himself$_{i/?j}$.
b. Bill$_i$ talked to a student$_j$ about himself$_{i/?j}$.
c. Bill$_i$ talked to a passerby$_j$ about himself$_{i/??j}$.
d. Bill$_i$ talked to someone$_j$ about himself$_{i/*j}$.

The possibility of subject binding decreases correspondingly as the topicality of the subject referent goes down along the nonsyntactic dimensions. The same correlation holds between the possibility of object binding and the topicality of the object referent.

10 Ariel (1990:123) holds basically the same view when she remarks 'Topic antecedents are superior antecedents, ones allowing non-sentential and even non-linguistic references. Indeed, once we consider such extra-textual antecedents, the borderline between grammatical and discourse anaphora seems much less sharp. If discourse topics behave as highly accessible antecedents at the sentence level as well, then the division between intra- and extra-grammaticality is perhaps artificial from the point of the linguistic coding system.'

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《漢語反身代詞“自己”》

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一般認爲，漢語反身代詞“自己”有兩個主要特點：一是[illegible]向主語， 二是遠距約束。生成語法學家從有關結構的句法組織出發，提出了種種理論以解釋上述特點。本文試圖轉換角度，利用功能語言學中的兩個概念來解釋有關現象。

本文認爲，在理解漢語反身代詞“自己”時起根本作用的[illegible]與其說是“自己”與先行詞之間的句法結構關係，不如說是先[illegible]語在語句中所表現出來的主題性和基點度。

北京話"知""資"二韻國際音標寫法商榷*

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1 問題所在

1.1 標寫法存在分歧

北京話"知""資"兩韻的標寫法，存在著很大的分歧。請看下表：

	知	概括兩者	資
IPA 1949:42		ə	
Luó+Wáng 1957:74-5	ɿ		ɪ
Dǒng 1988:58		ɪ̈	
Zhào 1968:23	ʐ̩		ʐ̩
Huang 1969:12	i		i

這兩個韻，上面共列了七個音標。這分歧該如何理解呢？

1.2 "ɿ""ɪ" 的 身份

上面七個符號中，又以 ɿ ɪ 最值得討論。一方面，這是華人社會用來代表"知""資"兩韻用得最多的符號；另一方面，外國學者對這兩個符號並不認識，簡直無從理解。

華人當中，毫不懷疑 ɿ ɪ 是國際音標的大有人在。例如 Xiè 1987:65 在講到上述兩韻時，清清楚楚地說：

> 國際音標用「ɪ」來表示，(....)國際音標用「ɿ」來表示。

就連 Cén 1957:17 和 Sòng 1987:50-52 這兩本以國際音標為論述對象的專著，也毫不含糊地拿 ɿ ɪ 兩符號跟其他國際音標並排列出，一起介紹。

雖然如此，修改至 1951 年的國際音標表，卻並沒有包括這兩個符號在內。但正如 Cén 1957:14 所說：

> 國際音標沒有一定的數目，初創擬時數量比較少，其後逐年有所增益(....)

...T. (ed.) 1992, *Research on Chinese Linguistics in Hong Kong*, pp. 37 - 46. Hong Kong: The Linguistic Society of Hong Kong.

1951年的音標表，誠然不能說明甚麼：ɿ ʅ 會不會是 1951 年新增的音標呢？事實是，隨著 IPA[注1] 1949 的出版，國際音標及其用法已基本上穩定下來，此後變動不大。到了 1979 年，國際語音協會[注2]又發表了修訂的音標表，雖視舊表稍有修改，卻仍然沒有 ɿ ʅ 兩符。最近發表在 Journal of the IPA 1989 年第 2 期的至 1989 年的音標表，作了自 1949 年以來最大的改動，卻也完全沒有提及 ɿ ʅ 兩符。

事實俱在，ɿ ʅ 兩符並非國際音標。Wú+Zhòu 1988 指出國際標不包括[ʅ] [ɿ]兩音，正可理解為不包括此兩"符"。

有些音標可理解為"外圍"的國際音標，例如代表舌面前濁摩擦的"ɟ"和代表央開不圓唇元音的"ɐ"等，不見於 1979 的音標表，但長時期在國際語音協會的會員間有一定的流通性，而且說不定甚麼候會為協會正式接納。像"ɟ"這符號，就是在 1989 年正式成為國際標的。Pullum & Ladusaw 1986 對這類音標也作了介紹。ɿ ʅ 顯然並不屬於這一類。

其實 Pullum & Ladusaw 1986 還頗詳盡地介紹了在國際間具有一定流通性的非國際語音協會音標，但 ɿ ʅ 兩符卻完全沒提及。理之簡單，就正如事實之無情：ɿ ʅ 兩符，在華人社會以外並不通行，它們既非國際音標，也非"國際的"音標。[注3]

1.3 "ɿ""ʅ"的來歷

這兩個符號的來歷，Luó+Wáng 1957:74 作了交代："這裡所用符號是借用瑞典的方言字母，不是國際音標。" 而 Zhào 1968:23 交代得更詳細：

> (....)國際音標的辦法(....)相當複雜。瑞典漢學家 Bernha Karlgren (....)提議中國語言裡頭應該注意舌尖元音的存在(....)給他這麼樣四個符號 (ɿ,ʮ,ʅ,ʯ)。

2 所涉及的若干理論問題

"ʅ""ɿ"兩符的身分既然如此，我們不禁要問，(a)"知""資"兩韻是否非用這兩個符號不可呢？要回答這問題，首先得弄清楚 (b)"知""資"兩韻是怎麼樣的音？而這兩個問題又涉及別的一些理論上的問題，這一節先就有關理論問題作簡要說明。

2.1 Contoid～vocoid 問題

這對概念，中文著作中絕少使用。Huáng等 1981 譯為"輔音"、"元音"，有違術語創設者 Kenneth L. Pike 有感於現成的術語 consonant～vowel 意義不夠確切而另造術語的原意。Liú+Zhào 1979 將 contoid 譯為"輔音(性)，聲學輔音"，vocoid 譯為"元音(聲學語音學)"，既不方便也不確切。本文直接借用英文原寫法。

這對概念是以發音時的節制(stricture)方式來區分的：凡在口腔的中線(非左非右之謂)造成摩擦或碰觸的謂之 contoid，否則就是 vocoid。

按照這種劃分法，基本(cardinal)元音圖的四邊形內任何一點都是 vocoid 固不在話下，就連國際音標表 1979/1989 上以"中(median，相對於"邊")通(approximant)"為類名的一組"輔音"也全都是 vocoid。這一組音裡頭的[j](不包括摩擦音[ʝ])和[w]，論音色分別等同於[i][u]；作為音節核心寫作"i""u"，否則寫 作"j""w"。[i,u]的節制等次(degree of stricture)跟其他中通音相同。既然[i,u]可作音節核心，沒理由其他中通音不可以。不同於"j,w"之可以寫作"i,u"，這些中通音欠缺專用於音節核心的"異寫"。與其說是缺點，倒不如說這更好地貫徹了一音一符的音標原則。而欠缺異寫也絕不會妨礙它們在實際發音中用作音節核心。事實上，在英語裡頭就有以[ɹ̩]為音節核心的發音，例如據 Jones & Gimson 1977，"library"可讀/'laɪbɹɪ/。[注4]

此外，contoid～vocoid 理論還給我們另一啓示：說國際音標沒有現成的舌尖"元音"音標也許不能算錯，但國際音標表上的"輔音"部分有專門為節制點在舌尖的通音而設的兩個現成的符號"ɹ"和"ɻ"。它們既是通音，就跟一般的所謂"元音"一樣都是 vocoid。"ɹ"和"ɻ"是否元音且不作爭論，它們起碼是 vocoid。

2.2 音節化

"音節化"指的是一般不作為音節核心的音在特定情況下用作音節核心，國際音標在有關符號之下(或上)加短豎表示，例如廣州話有音節化的[m̩]和[ŋ̩]。

音節化並不限於 vocoid；[m][ŋ]固非 vocoid，在英語中可音節化的[n][l] 也非 vocoid。[注5] 既然如此，說某音"音節化"並不意味著該音要改變成同部位的 vocoid。音節化並不要求在節制等次方面或音色方面作任何變更。上面提到的[m,ŋ,n,l]，其音色在音節化後依然是[m,ŋ,n,l]。音色的改變，例如由擦音變為通音，要另外說明，不能假定可由音節化符號推論出來。

2.3 多重節制點(multiple articulation)

國際音標主要為單一節制點的音提供現成的(單純)符號；但人類語音中具有雙重節制點的音不在少數。

雙唇是所有圓唇 vocoid 的兩個同時起作用的節制點之一。既然雙唇可作協同節制點，沒理由其他發音部位(特別是跟雙唇同樣靈動的舌尖)不能成為協同節制點。因此，如果一些處於音節核心位置的 vocoid，在舌面 (即dorsum,包括舌根和狹義的舌面,下同。) 起作用之餘，舌尖也起作用，那是一點也不奇怪的。"知""資"兩韻,正是這樣的音。

雙重節制點兩個發音部位，有時候有主次之分。主次是以節制次來劃分的：等次較高的為"主",較低的為次。節制等次若相等，就不能分主次，可稱為平等的雙重節制(coordinate co-articulation)。依 Catford 1977:188)。"知""資"兩韻的兩個節制點之孰主孰次，就要視乎兩節制點的具體發音方法了(詳第 3 節)。

2.4 變異性(variability)

在自然語言裡，變異無處不在，語音的變異也不例外。某語音位在實際發音上所存在的不能訴諸普通語音學理論的變異，只能明出來，而不能仰賴某一音標剛好是歧義的，還剛好對應了語音上的異。國際音標中，像1989 年之前的"j"那樣可同時表擦音和通音的並非正例，宜其在 1989 年分化為"j, ɻ "兩符。

3 北京話"知、資"二韻究竟是甚麼音？

理論問題討論過後，再來研究問題(b)。以下分發音部位和發音方法兩方面來說。

3.1 發音部位

就舌尖而言，兩音的發音部位沒有甚麼爭議：知韻跟北京話[ʂ]同部位,資韻跟北京話[s](要更細緻的話可標作[s̪])同部位。

舌面(包括舌根)的擺放位置，不能完全由舌尖的擺放位置決定。舌尖處於[ʂ]位置的時候，舌面不大能伸前縮後，擺放選擇不多，可以知韻就舌面而言可認為是個央元音。IPA 1949 和 Huang 1969 分別用 "ə""ɨ"去兼表知、資兩韻，也許就是基於對知韻的舌面部位的判斷。至於舌尖處於[s]位置的時候，則舌面有較大的擺放選擇，而資韻所用的擺放方式是舌體後縮、舌根上提。IPA 1949 對資韻的進一步描述說那是 ɯ 類音值；此外，Zhū 1986:84 所載資韻偏低的第二共振峰以及 Sòng 1988:50 的舌位圖，也在在說明了此韻就舌面而言的後元音本色。

3.2 發音方法

此兩韻在舌尖方面的節制類型，除了一般文獻上說的通音外，筆者觀察還容許有輕微摩擦。換句話說,兩韻在發音方法上有變異：

擦音通音兩可。至於在舌面方面，則一定不會有摩擦。IPA 1949:42 也指出此兩韻帶摩擦,但沒說這摩擦是可有可無的，也沒指出摩擦只能出現於舌尖節制點。

4 對上引其他標示法的評論

ɿ ʅ 兩音標的問題上面談過，至於第 1.1 節所引錄的其他標示法又如何呢？下面分節逐一討論。

4.1 ï

此符號最容易打發掉。一來，它跟 ɿ，ʅ 一樣也非國際音標，而且也來源於 Karlgren (1923:6)，只不過 Dǒng 1988 沒有說明，容易讓人誤會那是國際音標。二來，此符號是作為知資兩韻的概括性符號來使用的，而不論Karlgren 還是 Dǒng，對兩韻各自的發音都另外分別作了描述或標示。

4.2 ə

跟 ï 一樣,"ə"是兼表知資兩韻的概括性符號，而 IPA 1949:42 也對該兩韻分別另作描述。所不同者，ə 肯定是國際音標。ə 作為扁唇的中央元音,大體上反映了知韻在舌面方面的態勢，但對舌尖所起的作用則沒有交代。

4.3 ɨ

跟 ï ,ə 一樣，這符號兼賅知資二韻，所不同者，Huang 似乎認為知資二韻發音相同，而事實當然並非如此。ɨ 是扁唇高央元音的國際音標。就對舌面節制的交代而言，據筆者的觀察它比 ə 更恰當。但 ɨ 不適用於資韻。

4.4 ʐ̩ ʑ̩

前面(2.2)說過，音節化並不意味著 vocoid-化。按這一原則，ʐ̩ ʑ̩ 僅交代了帶摩擦的版本的知資韻在舌尖的節制。問題是，主張這麼標的 Zhào1968:23 明確地表示 ʐ̩ ʑ̩ "是當元音用，不當輔音用"，而他對"元音""輔音"的理解又是"阻礙多就成輔音，阻礙少就成元音"。這裡的矛盾是：趙氏認為兩韻是 vocoid，但這 vocoid 性質卻跟 ʐ̩ ʑ̩ 這樣的標示法不相符。

5 國際音標如何處裡?

5.1 超越單純符號的限制

除了圓唇的 vocoid (包括通音 ɥ,w)和捲舌的 ə(即 ɚ) 外，國
際音標簡直沒有甚麼交代雙重節制點的單純符號。其實，國際音標
來都不是光靠單純符號就解決一切標寫問題的，在細緻的(嚴式)標
上尤其如此。除了為數不太多的一組單純符號外，它還設有雙字母
(digragh，例如用於表示塞擦音和雙重節制點) 和附加符號制度。
不能充份運用雙字母和附加符號，國際音標的功能一定大打折扣。

就以資韻的通音版本為例，它的舌面發音可用單純符號 ɯ 來標
示，舌尖發音可用 z 附上代表"將節制等次降一級"的下加符號
"˕"即 z̞ 來標示；如想明確反映兩個節制點在同時起作用，則要用
由 ɯ 和 z̞ 臨時組成的雙字母來標示；為了明確所用的是雙字母，
字母之上又可附加"͡"號。最後的成品就是 ɯ͡z̞ 這樣的符號。

5.2 一音多寫，殊途同歸

作為音標系統，一符多音的歧義情形可免則免；但是，反過來
一音多寫，情況又有所不同：既有雙字母和附加符號的制度，那麼
途同歸 ——從不同角度、以不同的側重點，用不同的寫法去表達同
樣的音 —— 就是常見的而且是無可避免的。

還是以資韻的通音版本為例，它的舌尖發音可以考慮不用 z̞ 而
用 ɹ 來標示。ɹ 是個現成的通音音標，適用於由 ð 到 z 到 ʒ 的整
發音部位範圍。若跟 z̞ 比較，它勝在不需附加符號，但對發音部位
的交代則比較含糊。

此外，視乎兩個發音部位之間要側重標示哪一個，可以拿其中
、個部位用正常的(包括大小和位置兩方面)字母標示，另一部位用小
字母標於該正常字母的右上方，也就是說"資"韻的通音版本可標作
或 $ɯ^{ɹ}$。不過，對於前者，內行的、熟練的標音人多半寧可使用與之
差不多完全同"義"的 ɹ̴ 的寫法，其中重疊於 ɹ 之上的"～"代表軟
化或咽頭化。

舉一當可反三：從資韻的標法可以推及知韻，從純粹通音的版
可以推及舌尖部位帶摩擦的版本。下表列出三種立場對兩韻四種唸
的不同標法：

	知韻 擦	知韻 通	資韻[注6] 擦	資韻[注6] 通
舌尖舌面並重	ʐ͡ɨ	ɻ͡ɨ	z͡ɯ	z̞͡ɯ
側重舌尖	$ʐ^{ɨ}$	$ɻ^{ɨ}$	$z^{ɯ}$/ᵶ	$z̞^{ɯ}$/ᵶ̞
側重舌面	[注7]	$ɨ^{ɻ}$ [注8]	[注7]	$ɯ^{z̞}$

6 使用 "ʅ""ɿ"的誘惑

前面問題(a)"是否非用這兩個符號不可呢?"，答案當然是否定的。然則為甚麼它們在華人學術圈裡有這麼強的生命力呢？看來有下面幾個原因。

第一，知資二韻既牽涉以舌尖 vocoid 當音節核心，牽涉雙重節制點,牽涉語音變異，要對它們作分析和描述本就不是易事。在理論啓蒙的20年代,高本漢輸入這兩個專職代號，正好方便了大家姑且暫以速記性質符號代替細緻的分析和繁複的描述。

第二，對國際音標認識普遍不足，有人以為它沒法標示舌尖的vocoid,有人以為 ʅ ɿ 就是漢語所貢獻的國際音標。

第三，未能在音位標寫和細緻語音描述這兩項性質不同的工作之間劃清界線。從音位理論的角度看，可以認為知資二韻都沒有獨立性：或視為零韻母的兩種表現，或視為 i 韻母的兩種條件變體。從細緻語音描述的要求看,則有許多東西須要交代。ʅ ɿ 一身兼二任，是個折衷的做法，其代價卻是兩項工作都做不徹底。

伴隨 ɿ,ʅ 兩符而為 Karlgren 所一起引進的，尚有此兩符的圓唇版本ʮ,ʯ (見第 1.3 節所引 Zhào 1968 文)，四個符號合成一套。ɿ,ʅ 兩符的問題，也同時是 ʮ,ʯ 兩符的問題。兩組符號在華人中的流通程度或有不同，而其非國際性則一。即使我們有千百個理由在華人社群中繼續使用這四個符號,至少也應該對這些符號的非國際性心裡有數，並保持適度的警覺。

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[1] International Phonetic Association。
[2] IPA 的中譯據 Zhōngguó 1988。Chén等 1989 譯作"國際語音學協會"。
[3] Kratochvil (例如 1968:28-29) 也許是自 Karlgren 以來唯一使用這兩個符號的西方學者。
[4] 英語標音習慣以"r"表[ɹ]音。此外，Wells 1990:698 指出，/r/的音節化(也就是作為音節核心)以美式英語較常見。
[5] 連摩擦音也可當音節核心，"知""資"兩韻本身正好就是例子，詳下文(3.2)。
[6] 凡 ʐ 均可作 ɻ，此處不重複。
[7] 在此情況下，舌尖比舌面的節制高一級，不宜用側重舌面的標法
[8] IPA 1989 將"ɚ"符的右鉤獨立化為可跟任何元音並用的附加符號，代表廣義的"帶 r 色彩"(rhoticity)；按此原則，也可用 ɨ 加右鉤的辦法來表此音。ɨ˞是更為具體細致的標示法。

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[ENGLISH ABSTRACT]

IPA Transcription of the So-called "Apical Vowels" of Pekine

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The syllable necleus of "zhi"(知) and that of "zi"(資 of Pekinese, sometimes referred to collectively as the "apical vowels", have been notated allegedly in accordance with the IPA principles as "ɿ" or "ʐ̩"(for "zhi") and "ɿ" or "z̩" (for "zi") and "ə" or "ɪ̈" or "i̽" (for both). The use of "ɿ" and "ʅ" is most intriguing in that on the one hand linguists within Chinese communities are in general quite a home with the two symbols, often regarding them as the IPA symbols for the two sounds, and on the other not only are they not official IPA symbols but they are hardly internationally known for that matter.

This paper tries to answer the question as to how the two sounds should be transcribed in the IPA manner and to resolve the notational discrepancies cited above. It first takes a close look at what the two sounds really are and wh is the status of each of the symbols cited above, with spec reference to "ɿ "and "ʅ". The discussion appeals to the theory loaded concepts "contoid", "vocoid", "syllabicity", "multiple articulation" and "variability", to official IPA charts and to the principles of IPA transcription. A demonstration is then given as to how the two sounds can be notated in true accordance with the IPA principles in the light of the foregoing elucidations. An attempt is also mad to account for how the symbols "ɿ , ʅ" (together with their lip-rounded counterparts "ʮ,ʯ") have come to be uncritical received by Chinese linguists.

As far as they are made known to the public, resoluti of the Kiel Convention of the IPA, August 1989, are taken i account whenever IPA symbols and principles are referred to.

The Inadequacy of Processing Heuristics - evidence from Relative Clause Acquisition in Mandarin Chinese*

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Abstract

Mandarin-speaking children aged between 4 and 8 were examined on their comprehension of sentences containing relative clauses. Two cross-sectional studies were conducted which controlled for the matrix role of the coreferential NP (subject and object) and the role of the shared NP in the relative clause (subject, direct object, and indirect object). The findings show that relative clauses in which the subject or the object is relativized on were acquired as early as 4 years of age. Relative clauses involving indirect object relativization with resumptive pronouns were comprehended by 5. A processing heuristics approach fails to predict the order of difficulty of the various sentence types. It is argued that an adequate account must be based on syntactic structure.

1. Introduction

Two divergent positions have been taken on the issue of Relative Clause (RC) acquisition. One school of thought assumes that RCs are acquired late, not until after six years of age. On this view, the experimental evidence suggests that children resort to processing strategies in order to cope with complex structures. Studies with this assumption, whether implicit or explicit, typically emphasize processing strategies that only refer to linear concatenations of syntactic categories (Smith 1974, Sheldon 1974, 1977, Hakuta 1981, Clancy, Lee & Zoh 1986). For example, the canonical NVN schema or the Minimal Distance Principle (MDP) does not crucially depend on information about hierarchical structure.[1] Alternatively, researchers in the same vein may appeal to functional notions (MacWhinney 1982) or functional parallelism in grammatical relations (Sheldon 1974).

Another school of thought represented by Hamburger & Crain (1982, 1984) and Goodluck & Tavakolian (1982) assumes that relative clauses may in fact be acquired as early as four years old. The relatively poor performance of the child in the experiments is attributed to the inadequacy of nonlinguistic cognitive faculties (eg. memory span),

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or to the unnaturalness of the experimental task. These scholars have shown convincingly that children adhere to putative universal constraints such as the No Crossing Branches Constraint in constituent structure (Goodluck & Tavakolian). They have also demonstrated that if experimental conditions met the felicity conditions for restrictive relative clauses, children's performance would improve significantly (Hamburger & Crain 1982, Correa 1986).

This paper presents two cross-sectional studies of Mandarin-speaking children's comprehension of relative clauses carried out on 4- to 8-year-olds using an act-out task. Our findings suggest that the binding of the gap by the head noun is acquired by four, and the binding of resumptive pronouns is mastered by five. However, successful interpretation of transitive clauses containing RCs is achieved much later. The relative order of difficulty of RCs differing with respect to the position relativized on is consistent with the Keenan & Comrie Accessibility Hierarchy. We present an analysis of our data using Frazier & Fodor (1978)'s two-stage parsing model. We argue that our results cannot be satisfactorily accounted for by the processing heuristics approach alone, and that syntactic representations must be posited for the child.

1.1 Previous Research

Studies on the RC comprehension of English-speaking children have typically examined sentences such as (1-2) in which the head noun functions as the subject of the main clause, and sentences such as (3-4) in which the head noun serves as the object of the main clause. In (1) and (3), the head noun plays the role of subject of the RC, whereas in (2) and (4), it is the object of the RC. These sentences will be referred to as SS, SO, OS and OO sentences respectively.

(1) The cat [that _ bit the dog] chased the mouse (SS)
(2) The cat [that the dog bit _] chased the mouse (SO)
(3) The mouse chased the cat [that _ bit the dog] (OS)
(4) The mouse chased the cat [that the dog bit _] (OO)

The overwhelming majority of previous studies have employed the toy manipulation task. If we limit ourselves to studies of this type that give breakdown results for different age groups on each of the four sentence types (i.e. Sheldon, 1974, 77, Legum 1975, Tavakolian 1981, Abrahamsen & Rigrodsky 1984), a clear picture emerges. Without any exception, for each of the ages covered in these studies, both SS and OO sentences are easier to understand than either SO or OS.[2] The studies agree that for most of the older age groups (5-, 7-, 8-, 9-, 12-year-olds) the order of difficulty is SS < OO < OS <SO, with SS being the easiest. This hierarchy of difficulty was also found among 4-, 5-, 7-, 8- and 9-year-old French-speaking children (Sheldon 1977).

Parallel studies on languages with SOV canonical order and prenominal relative clauses, e.g. Japanese and Korean (Hakuta 1981, Clancy et al 1986), show a different order of difficulty among the RC sentence types. In these languages, left branching structures (SS and SO) are significantly easier than center embedded structures (OS, OO).

2 Relative Clauses in Chinese

Acquisition data on Chinese relatives will contribute to our general understanding of RC acquisition, because Chinese has different typological characteristics from SVO languages such as English or French and SOV languages such as Japanese or Korean. Relative clauses in Chinese precede the head noun and are marked by the morpheme *de*. A gapping strategy is used to relativize subject and direct objects, while resumptive pronouns are required for indirect objects, obliques, genitive phrases and objects of comparison (cf. Chao 1968, Li & Thompson 1981, Tang 1979). The examples corresponding to the four types of RC sentences are given in (5-8); relativization of indirect objects is exemplified by (9-10). All the test sentences used in this experiment are of the type RC-*de*-DET-N, which are perfectly felicitous in contexts that call for the identification of a subset of individuals from a larger set described by the head noun.[3]

(5) [_ bao zhe xiaoxiong] de neige baitu ti houzi (SS)
hug ASP teddy-bear NOM that rabbit kick monkey
"The rabbit that is hugging the teddy-bear kicks the monkey"
(6) [xioxiong bao zhe_] de neige baitu ti houzi (SO)
teddy-bear hug ASP NOM that rabbit kick monkey
"The rabbit that the teddy-bear is hugging kicks the monkey"
(7) xiaogou cai [_bao zhe houzi] de neige baitu (OS)
puppy step-on hug ASP monkey NOM that rabbit
"The puppy steps on the rabbit that is hugging the monkey"
(8) xiaogou cai [houzi bao zhe_] de neige baitu (OO)
puppy step-on monkey hug ASP NOM that rabbit
"The puppy steps on the rabbit that the monkey is hugging"
(9) [xiaogou ti *ta* shuaya] de neige baitu gen zhe xiaoxiong (SIO)
puppy for him brush-tooth NOM that rabbit follow ASP teddy-bear
"The rabbit for whom the puppy is brushing his teeth follows the teddy-bear"
(10) xiaoxiong gen zhe [xiaogou ti *ta* shuaya] de neige baitu (OIO)
teddy-bear follow ASP puppy for him brush-tooth NOM that rabbit
"The teddy-bear follows the rabbit for whom the puppy is brushing his teeth"

The word order differences between Chinese and English on the one hand, and those between Chinese and Korean or Japanese on the other, imply that certain sequences of verbs and noun phrases in the RC sentence types will be unique to Chinese and absent from English, Japanese or Korean. This will be apparent if we look at the configurations of the RC sentences.

	English	Chinese
(SS)	NP [that _ V NP] V NP	[_ V NP] *de* NP V NP
(SO)	NP [that NP V _] V NP	[NP V _] *de* NP V NP
(OS)	NP V NP [that _ V NP]	NP V [_ V NP] *de* NP
(OO)	NP V NP [that NP V _]	NP V [NP V _] *de* NP

Japanese/Korean

	SOV order	OSV order
(SS)	[_ NP_O V] NP_S NP_O V	NP_O [_ NP_O V] NP_S V
(SO)	[NP_S _ V] NP_S NP_O V	NP_O [NP_S _ V] NP_S V
(OS)	NP_S [_ NP_O V] NP_O V	[_ NP_O V] NP_O NP_S V
(OO)	NP_S [NP_S _ V] NP_O V	[NP_S _ V] NP_O NP_S V

(NP_S = Subject NP, NP_O = Object NP)

Just looking at the surface concatenation of syntactic categories, and ignoring relative clause markers and case marking for the time being, we see that English has the strings NP V NP V NP (SS, OS), NP NP V V NP (SO), and NP V NP NP V (OO) . Only one of these three sequences, i.e. NP V NP V NP, is found in Chinese. On the other hand, Chinese has the orders V NP NP V NP (SS) and NP V V NP NP (OS), which are unique to Chinese and not found in Japanese, Korean or English. Japanese and Korean show basically two sequences NP V NP NP V, and NP NP V NP V. These differences in configuration and surface order of syntactic categories should provide a basis for evaluating various hypotheses about how children comprehend RC sentences. In the present experiment, the results of the SS and the OS sentences should be of special interest, since these configurations are not found in the languages previously studied. An examination of how children comprehend RCs with resumptive pronouns should also be of interest since there has been scanty acquisition data on indirect object relativization (cf. de Villiers et al 1979).

Below, we report two experiments on RC acquisition in Mandarin Chinese. Experiment One examines sentences such as (5-10), which involve transitive matrix

clauses. Experiment Two examines intransitive clauses whose subjects are modified by RCs.

3. Experiment One

3.1 Predictions based on Processing Strategies

Two types of processing strategies have been proposed to capture the pattern of findings in the literature. One approach is best exemplified by Hakuta (1981), who accounts for the order of difficulty of the four RC types in terms of a combination of the NVN strategy (Bever 1970), the Minimal Distance Principle (Smith 1974) and the Conjoined Clause Analysis (Tavakolian 1981).

The NVN strategy stipulates that English-speaking 3- and 4-year-olds tend to interpret an NVN sequence as actor-action-thing acted upon. Subsequent research (Slobin and Bever 1982) provides further support to this line of thinking. It is assumed that for SVO languages like English, children may impose the NVN canonical sentence template on complex sentences in their interpretation. The Minimal Distance Principle as revised by Smith (1974) hypothesizes that like the null subject of an infinitival complement, the null subject of a relative clause is identified with the nearest preceding NP in the main clause. The Conjoined Clause Analysis (CCA) (Tavakolian 1981) assumes that the child favors flat structures over embedded structures, so that complex constructions may be reanalyzed as conjoined clauses.

Another processing approach advocates the use of functional heuristics. Sheldon (1974) proposes the Parallel Function hypothesis, which states that complex sentences in which coreferential NPs share the same grammatical function in their respective clauses are easier to understand than those in which the coreferential NPs have different grammatical functions. MacWhinney (1982) proposes another functional account using the notion of perspective maintenance. It is assumed that hearers use the first element in the sentence as a starting point in comprehension, to which the body of the sentence will be attached. The starting point serves as the basis for the construction of a perspective (MacWhinney 1977), which will be maintained until it is overtly cancelled by some new perspective. The perspective will be assumed to be the actor unless otherwise marked.

Scholars have also appealed to the Accessibility Hierarchy (Keenan & Comrie 1977) as a general constraint on processing. Structures which relativize on a position lower in the hierarchy should not be easier than those which relativize on a higher position in the hierarchy (e.g. SO and OO should not be easier than SS and OS respectively).

These hypotheses have received various degrees of support from data other than English. The Canonical Sentence Schema is clearly evidenced in Korean and Japanese. In those languages, a major error type is to interpret an initial NP NP V sequence as an

independent clause. The Parallel Function hypothesis is disconfirmed by Japanese (cf. Hakuta 1981) but receives partial support from Korean (Clancy et al 1986).[4] The Accessibility Hierarchy is violated in the Japanese data reported by Hakuta (1981), who conjectured that "in languages where the head noun is on the left of the relative clause, subject focus will be easier than object focus, whereas in languages where the head noun is on the right of the relative clause, object focus will be easier, other things being equal." This conjecture is not supported by Korean (Clancy et al 1986) or other studies of Japanese cited therein.

In this study, we will use non-syntactic processing heuristics as the basis of our predictions: the Canonical Sentence Schema, the Minimal Distance Principle, and the Parallel Function Hypothesis. CCA is not used because it has a different status from the other processing strategies. While NVN and MDP are typically interpreted by researchers to refer to only precedence relations, CCA involves assignment of syntactic structure according to the phrase structure rules of the language concerned. Perspective Maintenance is not adopted, as it remains unclear how it can be applied to languages in which some RC sentence types do not begin with a NP, but with a verb instead, e.g. SS sentences in Chinese. As we will see in later sections, the processing approach makes false predictions about the order of difficulty of RC types in Chinese.

An account of children's comprehension of the main and relative clause of the four RC sentence types based on NVN, MDP and the Parallel Function Hypothesis will give the predictions as shown in Table 1. We assume that by the MDP, the null subject and object of a relative clause will be linked to the nearest NP outside the relative clause. If the three strategies carry equal weight, one will predict that SS should be the easiest since the processing of both the main and RC is facilitated by at least two strategies. On the other hand, OS should be the most difficult because it is not favored by any strategy. One will also predict that OO and SO sentences are of approximately the same level of difficulty, with OO perhaps slightly easier than SO. It is doubtful whether these heuristics can be extended to resumptive pronouns, as the latter are lexical, and do not have the same properties as gaps (cf. Chao & Sells 1983).

Thus the set of predictions one could derive from processing heuristics is the following: SS < OO/SO < OS. The table also shows that in terms of the relative difficulty of main and relative clauses for different sentence types, one would expect main and relative clauses to be understood with equal ease in SS sentences. However, RC will be easier than the main clause for SO and OO sentences, but more difficult than the main clause for OS sentences.

Table 1: Predictions of Processing Strategies for Chinese Relative Clauses[a]

Strategy	SS [_V NP_1]de N_2 VNP_3		SO [NP_1 V_]de N_2 VNP_3		OS NP_3V[_V NP_1]de N_2		OO NP_3V[NP_1 V_]de N_2	
	Main Clause	RC	Main Clause	RC	Main Clause	RC	Main Clause	RC
NVN (Canonical Sentence)	+		+	+			-	+
MDP (Minimal Distance)		+		+		-		+
Parallel Function	+	+	-	-	-	-	+	+

([a]A + sign means the processing of the clause (main or RC) is favored by a strategy; a - sign means the processing of the clause (main or RC) is not favored by a strategy. The structure of the RC sentence types is given at the top. Throughout this paper, the following convention is adopted: NP_1 represents the lexical NP in the RC, N_2 the head of the complex NP, and NP_3 the other NP in the main clause.).

3.2 Materials, Subjects, Procedure

The test materials in this experiment controlled for two factors: the role of head noun in the matrix clause (subject vs object) and the role of the head noun in the RC (subject vs direct object vs indirect object). Six sentence types were used- SS, SO, OS, OO, SIO, OIO, with 4 test sentences per type. In addition, there were 6 control sentences and 3 practice sentences. The entire experiment thus consisted of 33 sentences (see Appendix 1). A representative sample of the sentence types is given in (5-10).

In the designing of the SS, SO, OS and OO sentences, four verbs were used, two of which denote actions involving the upper limbs (*bao, bei,*'hug, carry-on-back'), while the remaining two signify actions involving the lower limbs (*ti, cai,* 'kick, step on'). Within the SO sentence type, the verbs were assigned to the embedded verb and the matrix verb of each sentence subject to two restrictions. Each verb must be used at least once in both embedded and matrix positions. Secondly, a verb denoting action of an upper limb must cooccur with one referring to an action of the upper limb, and vice versa. The latter restriction was necessary to ensure that the child would not be inhibited when acting out sentences in which a toy animal may be agent for both the main clause and the RC. Thus the 4 test sentences of SO represent a random selection of 4 out of 8 logical possibilities with respect to verb choice. With respect to the referents of the NPs in the test sentences, 4 toy animals of equal size, which are not normally perceived to be aggressive in nature, were chosen: a teddy bear, a monkey, a rabbit, and a dog. The allocation of animals to the three NP positions in the sentence is subject to two restrictions: each animal must appear at least once as referent of the

lexical NP in the RC, and three different animals must be used for each sentence. The NP combinations for the SO sentence type represent, therefore, a random selection of 4 out of 24 logical possibilities. The SS sentences are identical to the SO sentences except that the lexical NP in the RC, which appears in subject position in SO sentences, now appears in object position in SS sentences. The OO and OS test sentences were constructed in a similar fashion. All sentences of these four types were 12 syllables in length.

The SIO and OIO sentences included a different set of verbs. The VPs of the RC used were: *gen ta zhaoshou* 'wave-hands to him', *gei ta xilian* 'wash-face for him', *ti ta shuaya* 'brush-teeth for him', *xiang ta jingli* 'salute to him'. In effect, intransitive predicates were used in the RCs of these test sentences.[5] Two matrix verbs, which referred to reversible actions that do not involve body contact, were chosen: *gen* 'follow' and *qian* 'hold-hands'. The four test sentences of SIO were thus selected randomly from 8 logical possibilities for verbs. The NP combinations were decided following the same requirements adopted above. The OIO sentences were identical to the SIO sentences except that the RC modified the matrix object instead of the matrix subject. The SIO/OIO test sentences were all 15 syllables in length.[6]

The test sentences (including three practice sentences) were randomized and recorded on tape by a native speaker of Beijing Mandarin. The sentences were read with a 'clear' intonation, with a slight juncture after the complex NP subject for SS, SO and SIO sentences, and one before the complex NP object for OS, OO and OIO sentences.

The subjects were 61 Mandarin-speaking children drawn from a preschool and a primary school in Beijing, China, with twelve 4-, 5-, 6- and 8-year-olds, and thirteen 7-year-olds. Care was taken to ensure that at least 6 subjects were available for the first half of each age group and 6 for the second half. The mean ages of the five age groups were 4;7, 5;6, 6;6, 7;5 and 8;5. The subjects were interviewed individually by two experimenters, one of whom operated the tape recorder and arranged the toys, while the other recorded the child's responses. The audio recording of the test sentences was made by one of the experimenters who is a native speaker of Beijing Mandarin. At the beginning of an experimental session, the experimenter made sure that the child could name the four toy animals and the objects for the SIO and OIO sentences (ie. towels and tooth-brushes).[7]

For each test item, the child was presented with three toys, one for each of the NPs in the sentence. Ideally, to satisfy the felicity conditions for RRCs, at least two animals of the type corresponding to the head noun should be provided (cf. Hamburger & Crain 1982, Correa 1986). But it was found in pilot sessions that 4-year-olds did not work well with too many animals laid out in front of them if asked to act out both the main clause and RC. It was therefore decided to restrict the number of animals to three

per sentence. The child was instructed to arrange the animals according to the sentences spoken on the tape. Each sentence was played once. If the child did not hear the sentence clearly, it would be repeated to him/her. The child was asked to listen carefully and not to start moving the toys until after s/he has understood the sentence. As the order of act-out has been shown to be relevant (cf. Hamburger & Crain 1982), the order of act-out of the child's actions for each sentence was recorded. Each individual session lasted approximately 25 minutes.

3.3. Results

The number of correct responses to the six sentence types for the five age groups is shown in Table 2. A response was scored 1 if both the main clause and the RC were acted out correctly; otherwise, it would be scored zero.

Table 2: Number of Correct Responses on Relative Clause Sentences

Age		SS	SO	OS	OO	SIO	OIO
4 year-old	% correct	41.7	25	14.6	2.1	10.4	6.3
	Total possible	48	48	48	48	48	48
5 year-old	% correct	56.3	14.6	8.3	6.3	31.3	2.1
	Total possible	48	48	48	48	48	48
6 year-old	% correct	79.2	14.6	31.3	14.6	47.9	6.3
	Total possible	48	48	48	48	48	48
7 year-old	% correct	90.4	55.8	48.1	17.3	59.6	1.9
	Total possible	52	52	52	52	52	52
8 year-old	% correct	93.8	72.9	93.8	45.8	70.8	14.6
	Total possible	48	48	48	48	48	48
All Ages	% correct	72.1	36.9	43.4	17.2	44.3	6.2
	Total possible	244	244	244	244	244	244

If we first focus on the sentence types involving subject and object relativization, we see that for all ages, SS was the easiest of the four types, and OO the most difficult. 79.2 % of the total responses of the 6-year-olds in SS sentences were correct and the figure reached 90.4 % in the seven-year-olds. In contrast, the percentage of correct responses on OO sentences remained extremely low (under 20%), and climbed to only 45.8 % at 8. Performance on SO sentences was slightly better than on OS sentences for the 4-, 5- and 7-year-olds, but on the other hand, OS was superior to SO for the 6- and 8-year-olds.The figures indicate that even 7-year-olds were interpreting SO and OS sentences correctly only approximately 50 % of the time, and these sentence types were not mastered until around 8 years old. With regard to

sentences involving indirect object relativization, although SIO recorded a lower figure than OS and SO among the 4-year-olds, it proved superior to both SO and OS for 5-,6- and 7-year-olds. The SIO figure for the 8-year-olds (70.8%) was at about the same level as that of SO. In contrast, OIO was the most difficult of the six RC types among the 5- to 8-year-olds.

To obtain a more reliable estimate of the point of acquisition of these structures, the number and percentage of subjects within an age group who were correct on three or more test sentences of a sentence type are given in Table 3. Here we get a sharper picture of the relative difficulty of the 4 types. SS is by far the easiest and OO the worst understood. If we take 75% of an age group responding correctly 75% of the time as a criterion for acquisition of these structures, it could be claimed that SS is acquired by six, and SO and OS acquired by eight years of age. However, none of the 4- to 6-year-olds, and only one-third of the 8-year-olds, were able to give more than two correct responses for OO sentences. SIO appears to be mastered by eight, at the same age as SO and OS, but none of the subjects in any age group could respond with 75% accuracy on the OIO sentences. Performance on SIO and OS sentences was superior to that on SO sentences in the intermediate age-groups (5-, 6-, and 7-year-olds).

To determine the significance of the difference between the various sentence types, one-way ANOVA (Tukey test) was carried out for each of the five age groups. The results (shown in Table 4) confirm the general patterns observed in Tables 2 and 3.

The picture shows that while results on SS were the best for all age groups, the second easiest category varied according to age. It was SO for the 4-year-olds, SIO for the 5-year-olds, OS and SIO for the 6-year-olds, OS, SIO and SO for the 7-year-olds, and OS, SO, SIO and OO for the 8-year-olds. What this suggests is that if we focus on the age span 4 through 8, the relative order of difficulty could be stated as: SS < SIO < OS < SO < OO < OIO.

Table 3: Number of Subjects with three or more Correct Responses on a Relative Clause Sentence Type

Age		SS	SO	OS	OO	SIO	OIO
4 year-old	No. of subjects	3	2	1	0	0	0
	% of Age group	25	17	8	0	0	0
5 year-old	No. of subjects	5	0	1	0	2	0
	% of Age group	42	0	8	0	17	0
6 year-old	No. of subjects	11	0	3	0	4	0
	% of Age group	92	0	25	0	33	0
7 year-old	No. of subjects	12	6	8	1	7	0
	% of Age group	92	46	62	8	54	0
8 year-old	No. of subjects	12	9	11	4	9	0
	% of Age group	100	75	92	33	75	0

Table 4: Mean Scores of Relative Clause Sentences (Total Possible = 4)

Age	SS	SO	OS	OO	SIO	OIO	Significant Differences (Tukey test, p<.05)
4 year-old	1.67	1.00	0.58	0.08	0.42	0.25	SS> OO, OS, SIO, OIO
5 year-old	2.25	0.58	0.33	0.25	1.25	0.08	SS> SO, OS, OO, OIO; SIO> OIO
6 year-old	3.17	0.58	1.25	0.58	1.92	0.25	SS> SO, OS, OO, SIO, OIO; SIO> SO, OO, OIO
7 year-old	3.62	2.23	2.69	0.69	2.38	0.08	SS> SO, OO, OIO; SIO> OO, OIO; OS> OO, OIO; SO> OO, OIO
8 year-old	3.75	2.92	3.75	1.83	2.83	0.85	SS> OO, OIO; OS> OO, OIO; SIO> OIO; SO> OIO; OO> OIO

In order to see whether the sentence types in which RCs are center-embedded (OS, OO) are more difficult than sentence types in which RCs are left-branching, a one-way ANOVA was carried out with each subject's total score on a sentence type (maximum possible=4) as the dependent variable, and the role of the head noun in the matrix clause as the repeated-measures independent variable. It was found that if only the four sentence types -SS, SO, OS, OO- were included, the child subjects as a whole did significantly better on SS/SO (left-branching) sentences than on OS/OO (center-embedded structures) ($F(1,142) = 24.85$, $p < .001$). This pattern is true of each of the age groups, except for the 8-year-olds. The picture remains the same if the SIO and OIO sentences are included. Sentences in which the matrix subject is modified by the RC are significantly easier than those in which the matrix object is modified by the RC. This result holds for all the age groups studied and for the child subjects as a whole ($F(1,364)=59.89$, $p<.001$).

To see whether significant differences could be found which vary according to the position relativized on in the RC, a one-way ANOVA was performed with the subject's total score on sentences of a particular type as the dependent variable and the position of relativization as the repeated measures variable. Sentences involving subject relativization (SS, OS) were compared to those involving direct object relativization (SO, OO) as well as those involving indirect object relativization (SIO, OIO). The results show that subject relativization is significantly easier than direct object relativization for all but the 4-year-olds and for all ages combined. Subject relativization is also significantly easier than indirect object relativization for all but the 5-year-olds and for all ages grouped together ($p < .05$). The difference between direct object relativization and indirect object relativization is, however, not significant at any age.

As has been shown in some of the previous studies (Sheldon 1974, Clancy et al 1986), parallel function may be a relevant factor in determining the level of difficulty of the test sentences. Another ANOVA was run with the subject's score (maximum=4) as the dependent variable and regrouped sentence type as the within-subjects variable contrasting SS/OO sentences with the SO/OS sentences. The results reveal that although parallel-function sentences were generally easier than non-parallel-function sentences for the 4- to 6-year-olds, the difference was significant only in the 5- and 6-year-olds. This is not surprising in view of the children's relatively superior performance on SS sentences. In the older-age groups, however, it is the non-parallel-function sentences that have higher mean scores.

To gain a deeper understanding of how subjects process these sentences, children's responses on both main and relative clauses were tabulated separately. The number of correct responses on main and relative clauses across various age groups is indicated in Table 5.

Table 5: Number of Correct Responses on Main and Relative Clauses[a]

	[_V NP_1]de N_2VNP_3		[NP_1 V_]de N_2VNP_3		NP_3V[_V NP_1]de N_2		NP_3V[NP_1 V_]de N_2	
Age	SS		SO		OS		OO	
	Main	RC	Main	RC	Main	RC	Main	RC
4	26	30	17	30	22	9	8	13
5	34	32	14	32	19	6	8	13
6	41	43	11	41	27	17	10	14
7	49	49	29	52	42	36	9	20
8	46	46	35	47	47	45	22	29

	[NP_1 P pro V']de N_2 V NP_3		NP_3 V [NP_1 P pro V']de N_2	
Age	SIO		OIO	
	Main	RC	Main	RC
4	29	11	14	5
5	33	18	8	7
6	32	33	9	10
7	47	34	5	3
8	44	37	13	13

[a]The total number of correct responses possible for each category is 48 for 4-, 5-, 6-, and 8-year-olds, and 52 for 7-year-olds. Main=main clause, RC=relative clause, pro= resumptive pronoun, V'=relative clause predicate.

As can be seen from the table, limiting our attention first to SS, SO, OS, and OO sentences, generally not much difference is found between the number of correct responses on main and relative clauses on SS sentences (which are left-branching) for any of the age groups. However, for the other left-branching sentence type in which the object is relativized on (SO), RCs were considerably easier than main clauses throughout the entire age range studied. With regard to the sentences containing center-embedded RCs (OS, OO), for instances of subject relativization (OS), the main clause is responded to correctly more often than the RC. On the other hand, for cases of object relativization (OO), it is the RC that shows a larger number of correct responses. With the SIO sentences, the main clause receives a higher percentage of correct responses for the 4- 5-, 7- and 8-year-olds, the responses on main and relative clauses being approximately the same among the 6-year-olds. The OIO sentences reflect equal levels of performance on main and RCs, except for the 4-year-olds, who gave more correct responses on main clauses than RCs.

The results on the order of the subjects' act out of the main and RCs follow a very uniform pattern. In previous research (cf. Hamburger & Crain 1982), it was suggested that the child might find it easier to act out sentences in which the presupposed information (ie the RC) precedes the assertion (i.e. the main clause), i.e. on SS and SO sentences.

In this study, the distribution of correct responses according to the order of act out is not related to the semantic distinction between RCs and the main clause, but rather reflects the semantics of the verb and the practical constraints of the experimental task. Generally, the embedded verb was acted out before the main verb when the embedded verb denoted an action involving the upper limbs (ie. *bao*, 'hug', *bei* 'carry-on-back') and the main verb described an action involving the lower limbs (*ti* 'kick', *cai* 'step-on'), by virtue of the experimental design. This holds true for all age groups. On the other hand, the main verb was acted out first when it signified an upper-limb action and the embedded verb a lower-limb action. In other words, for practical and pragmatic reasons, children first acted out the action involving the upper limbs before moving on to act out the motions involving the lower limbs. This finding is of interest because it shows that the order of act-out may not follow the order of mention of the RC and main clause.

Summary of Findings[8]

(a) We summarize here the findings hitherto presented: SS was the easiest sentence type across all ages, and OO, OIO were consistently the most difficult. The relative difficulty of SO, SIO, and OS depends on age. SO had an initial superiority over OS and SIO in the 4-year-olds, but was subsequently dominated by OS and SIO, the latter being the second easiest type (next to SS) among the 5- and 6-year-olds. For the 7- and 8-year-olds, however, OS was the best understood of these three categories.

(b) The subjects gave correct responses more frequently when the RC modifies the matrix subject than when it modifies the matrix object. Sentences containing RCs in which the subject is relativized on is easier than those containing RCs in which either the direct object or the indirect object is relativized on. In general, there is no clear evidence in support of the parallel function hypothesis. SS and OO sentences were significantly easier than SO and OS sentences only for the 5- and 6-year-olds, and this result can be attributed to the vastly superior performance on SS sentences over all the other sentence types.

(c) With regard to the relative difficulty of main and relative clauses, it was found that except for the SS sentences, RCs were interpreted correctly more often than main clauses when the position relativized on is the direct object. For sentences involving subject relativization, main clauses were interpreted correctly more often than RCs.

4. Discussion

In discussing our results, we first note that the Hakuta conjecture is disconfirmed by the Chinese data, since the order of difficulty of the RC types is consistent with the Accessibility Hierarchy. SS is significantly easier than SO or SIO

for 4- to 7-year-olds, and OS is significantly easier than OO and OIO for the 7- and 8-year-olds (cf. Table 4).

The predictions of the processing strategies regarding the relative order of difficulty of the Chinese sentence types are not confirmed by the data. The expected order of difficulty is SS < OO/SO < OS, but the observed order is SS < OS < SO < OO. The only correct claim is that SS is the easiest to comprehend. On the other hand, the predictions based on Table 1 vis-a-vis the relative difficulty of RCs and main clauses are supported by the empirical findings. Table 5 shows that generally the numbers of correct responses on main and RCs are the same for SS sentences. For SO and OO sentences (cases of direct object relativization), relative clauses are understood better than main clauses. The opposite is true of OS sentences.

4.1 Problems with Non-syntactic Processing Strategies

We begin with some general remarks about the inadequacy of the processing approach. Almost all previous studies focused on transitive clauses containing RCs modifying matrix subjects or objects. Strictly speaking, this is not the same as studying the acquisition of relative clause structure, which should involve, first and foremost, a grasp of the complex NP consisting of the RC and the head noun, and the binding of the gap or resumptive pronoun by the head. The ability to comprehend the internal structure of the complex NP should in principle be independent of the ability to additionally handle the remainder of the sentence. In most RC studies, these two aspects of the child's competence are studied in conjunction. But as shown in Hamburger & Crain (1982), one could examine RC acquisition by just looking at one of the 4 types of the RC sentences. The study of processing heuristics that stem from the complexity of the RC sentences may not provide direct clues to the path of RC acquisition.

The processing approach implicitly assumes that phrase structure does not come into the picture at all: when responding to RC sentences under experimental conditions, the child is unable to utilize syntactic representations, but needs to fall back on simpler heuristics as shortcuts to comprehension. The problem inherent in this approach, as noted by Goodluck and Tavakolian (1982), lies in its failure to investigate the competence or performance status of such strategies. What relationships do these strategies, which are allegedly universal (cf. Clancy et al 1986), bear to the child's developing grammar? At what point does the child acquire the RC structure, and if it is acquired late, how do children switch from total reliance on strategies to adherence to grammatical principles? In other words, the approach does not address the central problem of continuity in grammatical development (cf. Wexler & Culicover 1980, Gleitman & Wanner 1982).

Experimental evidence is available which casts doubt on the explanatory validity of the processing heuristics. Sherman (1987) raised the issue whether something as intuitively appealing as the MDP accurately reflects the principles governing the development of anaphora (cf. also Maratsos 1974). She found that while 3-8 year-olds chose the matrix object more often than the subject as the controller of the infinitival complement in (11-12), they chose the matrix subject more often than the object as the antecedent of the pronominal subject in tensed complements, such as (13-14).

(11) John promises Bill [_ to leave]
(12) John tells Bill [_ to leave]
(13) John promises Bill [that he will leave]
(14) John tells Bill [that he will leave]

Further, the MDP also fails to explain why on imitation tasks (which do not involve interpretation of argument relationships), children gave more correct responses to infinitival complements of object control verbs such as (12) than to those involving subject-control verbs as in (11). If the MDP does not reflect the true picture with verbal complements, why should one accept it at face value as an explanatory principle for RCs?

We now have increasing evidence that children do have access to abstract principles of grammar at an early age. Recent work on the acquisition of Binding Principles by Chinese- and English-speaking children (Chien and Wexler 1987) indicate clearly that 4 year-olds are sensitive to the c-command condition in interpreting reflexives. Crain and Nakayama (1987) have also shown that 3- and 4-year-old English-speaking children do not violate structure-dependence in interpreting yes-no questions. In the face of such empirical data, one should not assume that young children are incapable of referring to abstract syntactic structure in trying to understand complex sentences.

Not only may some of the processing heuristics be empirically inadequate, the question of how these various strategies interact with each other to produce the predicted effects is not entirely clear. Are the strategies of the same strength? If not, what factors determine their relative effectiveness? For example, for OS sentences (cf. (3)), it is argued that the potential for CCA induces errors on OS sentences, despite the fact that it is aided by the NVN strategy and the MDP (cf. Hakuta 1981). But why should the CCA prevail over the MDP is left unexplained. In addition, the processing account assumes that if no strategy applies to a sentence type, that sentence type will turn out to be difficult. This works by and large for English data. As we will see, however, this is not true of Chinese.

4.2 Parsing Analysis

We propose for each sentence type an account of the data assuming that the childrens' errors were due to parsing misanalysis, and hypothesize how children may progress from errors to correct interpretation as they mature. It will be assumed throughout the analysis (and demonstrated in our report of Experiment Two) that the binding relationship between gaps and the head noun is acquired by 4 years of age. Our analysis will be based on the findings reported above, with the error data recomputed according to a criterion of within-subject consistency. The children's error responses are reclassified according to the number of subjects in an age group that gave a certain response to a sentence type on at least two test sentences (see Appendix 3 for details).

We hypothesize that Frazier & Fodor (1978)'s two-stage parsing model is relevant to children's comprehension of RCs. The model proposes that two different kinds of mechanisms work in conjunction in syntactic processing. One kind of mechanism, called the Preliminary Phrase Packager (PPP or the Sausage machine), has a narrow window that lets in approximately six words at a time for analysis. Its main task is to assign a phrase marker to the words scanned. In theory there is no limit to the structural complexity of the phrase marker assigned to the segment within the scope of the window. This first-stage parser scans the sentence from left to right, lets in as many words as the length restriction permits, assigns a phrase marker to the first chunk by analysis, which is then passed on to the second-stage parser. The first-stage parser then clears its window, moves right to the second chunk it encompasses and works on another structural description. At the end of this process, the result will again be sent to the second-stage parser.

The assemblage of the products of the first-stage parsing is done by the second-stage parser, called the Sentence Structure Supervisor (SSS), which will take the component phrase markers and integrate them into a full phrase marker for the sentence. The SSS, which is not subject to any length restrictions, is also responsible for determining syntactic dependencies and predicting the shape of the overall structure of the sentence. This two-stage parsing model has received considerable support from evidence such as the contrast between (15) and (16). In (15), the *for*-phrase is readily interpreted as the complement of the verb *buy*. In (16), however, the *for*-phrase is most naturally understood as the complement of *obtain*.

(15) John bought the book for Susan.
(16) John bought the book that I had been trying to obtain for Susan.

The association of the for-phrase with the matrix verb is readily available in (15) because it falls within the same window as the verb. In (16), the *for*-phrase is not analysed as the same chunk as the verb *buy*, but belongs to the same window as the

embedded verb *obtain*. Therefore, the most natural reading of (16) is one that corresponds to modification of the embedded verb by the *for*-phrase.[9]

In our analysis of the child data, we will assume that the parsing window of the child is slightly shorter than that of the adult's, approximately 3 to 4 words in length. However, the exact length of the material falling under a window depends not only on the general constraints imposed by the parsing model (ie. not more than a certain number of words per window, in our case approximately 4 words), but also on the child's sensitivity to the presence of grammatical morphemes that serve as cues to clausal boundaries. Whether a phrase marker can readily be assigned to a particular chunk may be a third factor affecting the exact length of the material included within a window.

4.2.1 SS Sentences ([_ V_e NP_1] *de* N_2 V_m NP_3)[10]

Recall that the structure of SS sentences involves a verb-initial configuration which is not found in English or Japanese/Korean. The correct response should be $2V_e1$, $2V_m3$ We hypothesize that a seemingly correct response may arise based on a structure different from the standard analysis of SS sentences. The child does not register the RC marker *de* in the experimental situation, so that he interprets the initial NP V NP as a clause with a null subject. This constitutes the first segment. The second chunk will contain a full clause composed of the last NP V NP sequence in the sentence. The second-stage parser attaches the first S as an adverbial of the second S. This will yield the interpretation $2V_e1$, $2V_m3$ because backward zero anaphora is permissible in Chinese, as in (17). This accounts for the superiority of the performance on SS sentences.

(17) [e chi le fan] women qu kan dianying
eat ASP rice we go see movie
"After having (the) meal, we will go to a movie"

Concerning the finding that both the RC and the main clause recorded roughly equal frequencies of correct responses, we suggest that this is a consequence of the parsing of the sentence. The RC and the main clause fall into separate packages, and clausal boundaries are thus correctly identified.

Note that one could offer an alternative plausible account of the data on SS in terms of processing heuristics. Thus if one assumes that the child is sensitive to *de* as a RC marker, the MDP can coindex the null subject with the head noun and the NVN canonical strategy will correctly identify the main clause. The results here do not therefore reflect the inadequacy of the processing account.

4.2.2 SO Sentences ([NP_1 V_e _] *de* N_2 V_m NP_3)

Recall that the SO sentences were predicted to be relatively easy to comprehend, facilitated by the NVN strategy and the MDP. But in actuality, they were more difficult than OS and SIO sentence types for most of the age groups (cf. Table 3). We observe that only one kind of analysis of the SO type is possible besides the adult analysis. At the first stage of parsing, assuming that the child may not be sensitive to the presence of *de*, s/he may group the first NP V NP sequence as a clause and the remaining V NP sequence as a VP. At the second stage, a conjoined structure will be produced giving the reading $1V_e2$, $1V_m3$. Attachment of the second VP as a daughter of the first VP is ruled out by verb semantics. Therefore the only error type for the SO sentences is the reading $1V_e2$, $1V_m3$ (see Fig. 1). The parsing analysis has the advantage of predicting the absence of $1V_e2$, $2V_m3$ reading, since by the time the first-stage parser moves to the second half of the sentence, it will have lost access to the first chunk, which contains NP_2.

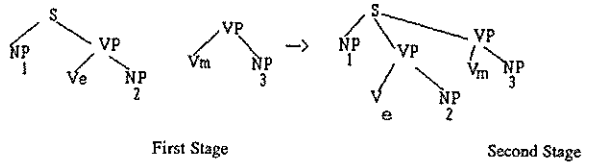


Fig. 1: Children's Parsing of SO Sentences

Under this account, RCs are better understood than main clauses on SO sentences because RCs form an integral component in the parse, but the main clause does not. Further the second VP will be predicated of the wrong argument (ie. NP_1 rather than NP_2) at the second stage of the parsing.

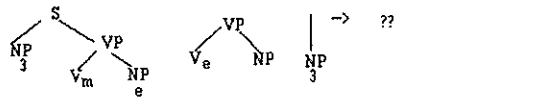
4.2.3 OS Sentences (NP_3 V_m [_ V_e NP_1] *de* N_2)

The results of the OS sentences carry special significance. As observed in Section 2, the combination of verbs and NPs exhibited in OS sentences is unique to Chinese and not found in English or Japanese. Secondly, we have a structure which is seemingly not facilitated by any strategy. As the findings indicate, however, OS sentences are just as easy to comprehend as, if not easier than, SO sentences.(cf. Tables 3 and 4).

The correct analysis of OS sentences is difficult because it requires, first of all, assigning the two adjacent verbs to different clauses, and secondly sensitivity to the

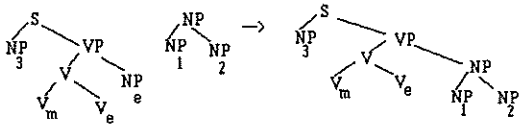
presence of *de* near the end of the sentence so that the second package can be analysed as a complex NP.

Fig. 2 (a) shows a garden-path analysis in which the last NP of the input sentence is not interpreted as part of the sentence. The parser groups the first NP and V into a clausal unit, with a null object, required by the semantics of the verb. The second verb is not incorporated into the first window, either because the child finds verbal coordination difficult, or because the child is sensitive to the intonational juncture between the main verb and the RC. In the second parsing window, the second verb and the second NP form a VP. However, when the parser moves to the remaining NP in the sentence, the problem arises as to how this can be attached to the tree in accordance with the phrase structure rules of the language.



First Stage Second Stage

Fig. 2 (a)



First Stage Second Stage

Fig. 2 (b)

Fig. 2: Children's Parsing of OS Sentences

On one analysis, the second VP attaches to the first S, and NP_2 is identified with the object of V_m by the exigencies of the experimental situation, since the action denoted by the first verb has to be performed on some object. This will yield the response $3V_m2$, $3V_e1$, which constitutes the only error type of the 4-year-olds (see Appendix 3). On another analysis, the second VP and NP_2 may form a clause, with NP_2 functioning as a post-verbal topic In such a case, NP_2 may function as subject of V_e and object of V_m. This will produce the correct response, $3V_m2$, $2V_e1$.

Alternatively, as in Fig. 2(b), the first packaging may conjoin the two verbs, and the second package treats the last two NPs as conjoined. The resultant phrase

marker will be a structure that produces respectively-readings. As shown on the right hand side of Fig. 2 (b), the main verb may associate with NP_1, giving rise to the second type of error- $3V_m1,3V_e2$, which emerged in the 5- and 6-year-olds. Or the main verb may associate with NP_2, producing the error $3V_m2,3V_e1$. This verb-conjunction analysis will not be favored as the child matures, because spoken Mandarin prohibits verbal coordination in transitive clauses (cf. Sanders and Tai 1972).

Under our analysis, main clauses scored more correct responses than RCs, because the relationship between the matrix subject (NP_3) and V_m is established in the first phrasal package, and so correct understanding of the main clause only depends on the identification of the matrix object. In contrast, the various possibilities of grouping the elements of the RC make the latter more susceptible to misinterpretation.

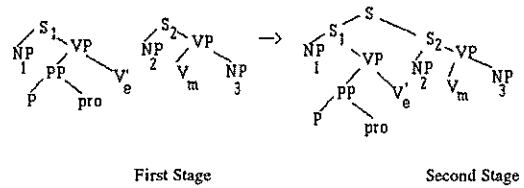
4.2.4 OO Sentences ([NP_3 V_m [NP_1 V_e _] *de* N_2)

OO sentences were one of the two most difficult sentence types, contrary to prediction. With OO sentences, we suggest that two kinds of parsing are possible during the first parsing stage. One is that the first NP V NP sequence is treated as a clause; the remaining part of the sentence (with *de* ignored) will form a VP. This will naturally lead to a conjoined VP reading, resulting in the dominant error type $3V_m1$, $3V_e2$.

The OO sentences are difficult because the first-stage parser is apt to wrap up as many words as possible in a window within the length limits, as long as a phrase marker can readily be assigned to the chunk. This will mean that NP_1 is in the main clause rather than the RC. Thus, in addition to tuning in to the RC marker *de*, one needs to be extremely sensitive to suprasegmental cues for a clause boundary between the first V and the following NP. On this account, the main clauses are interpreted less accurately than relative clauses because of the propensity to group the subject of the RC (NP_1) as part of the main clause in the first parse.

4.2.5 SIO Sentences ([NP_1 P pro V_e'] *de* N_2 V_m NP_3)

While superior performance on SIO sentences in comparison to OS and SO sentences was not statistically significant, the figures in Tables 2 and 3 suggest that SIO was the second easiest sentence type beginning with the 5-year-olds.



First Stage Second Stage

Fig. 3 : Children's Parsing of SIO Sentences

Fig. 3 shows how an analysis different from the adult analysis may produce a correct response. Under the assumption that *de* is ignored, the RC forms a clausal unit, with the main clause as the second segment. If the second-stage parser conjoins the two clauses, the main clause (S_2) will necessarily be interpreted correctly. The interpretation of the RC, however, depends on the interpretation of the pronoun. No grammatical principle will allow the child to assign reference to the pronoun. On the one hand, it has to be free from the subject NP of the RC according to Binding Principles (Chomsky 1981). On the other hand, it is impossible for the pronoun to be identified with a following NP, since in Chinese backwards anaphora for lexical pronominal elements is possible only for resumptive pronouns. The children were required by the experimenter to interpret the pronoun, and yet they had no grammatical principles to turn to for such a task. They thus arbitrarily assigned one of the NPs in the second clause as the antecedent of the pronoun. If the child assigned NP_2, the response would be identical to the correct response. Our analysis will also predict that main clauses should record a higher percentage of correct responses than RCs, since it is the main clause, but not the RC containing the pronoun, which will always be correctly interpreted (cf. Table 5).

4.2.6 **OIO Sentences** (NP_3 V_m [NP_1 P pro V_e'] *de* N_2)

Like the OO sentences, the OIO sentences present a segmentation problem due to the initial NP V NP sequence, which contains a clausal boundary between the main verb and the second NP. As shown in Fig. 4. The initial NP V NP sequence is identified as a clause. The remainder of the sentence, which falls into the scope of the second segment, contains a VP followed by a postverbal topic (N_2). The idea is that whatever structural description is assigned to sentences such as (18) will be assigned to the second segment.

(18) biye le, Zhangsan
graduate ASP Zhangsan
"Zhangsan has graduated"

Once the two clauses are conjoined, what remains to be done is to determine the reference of the pronoun. It may be anaphoric to either of the two preceding NPs, NP_1 or NP_3. This predicts that we could have the interpretation $3V_m1$, $2V_e1$ or $3V_m1$, $2V_e3$. Precisely these account for two of the major error types. In fact, two of the 7-year-olds seem to have interpreted the pronoun as a plural NP and group NP_3 and NP_1 as the conjoined indirect object of the intransitive predicate of the RC, yielding the response $3V_m1$, $2V_e'[3,1]$ (see Appendix 3).

In the preceding discussion, we have given an analysis of some of the possible parsing analyses carried out by children in their interpretations. As is clear from our discussion, the particular range of error types possible and the relative ease of comprehension of main and RCs do not follow in a straightforward way from the center-embeddedness of RCs. Neither does the overall processing difficulty follow from processing heuristics such as the NVN or parallel function strategies. The failure of the non-syntactic approach to predict overall success in sentence interpretation lies in its total exclusion of grammatical representations from the child's processing mechanism. The phrase structure of the language provides the child the crucial means of combining component constitutents into the larger sentence, but it is precisely this structural device that has been left out of the picture. In addition, the complexity of sentence interpretation may depend crucially on principles governing specific types of elements within the sentence (e.g. pronouns vs gaps). These complexities cannot be reduced to a small set of processing heuristics whose empirical status is subject to increasing challenge from recent research.

5. Experiment Two

In our discussions of Experiment One, it was assumed that the problem confronting the child is not the binding relation between the gap or the resumptive pronoun by the head noun, but rather the length and complexity of the sentence. Because of the 'short-sightedness' of the first-stage parser, children find it difficult to arrive at the complex configurations of these test sentences, unless they are capable of using very subtle cues to recognize major constituent boundaries and the clausal embedding in the complex NP. Following this line of thought, one should expect the child to show no difficulty in RC binding if we shorten the length of the sentence, for example, by making use of a one-argument verb in the matrix clause. A second experiment was carried out to explore this possibility. Three types of test sentences, hereafter referred to as SSVI, SOVI and SIOVI respectively, were used, illustrated in (19-21).

(19) [_ bao zhe xiaoxiong] de neige baitu shui le (SSVI)
hug ASP teddy-bear NOM that rabbit sleep ASP
"The rabbit is hugging the teddy bear has fallen asleep"

(20) [xiaoxiong bao zhe _] de neige baitu shui le (SOVI)
teddy-bear hug ASP NOM that rabbit sleep ASP
"The rabbit the teddy bear is hugging has fallen asleep"
(21) [houzi gei ta xilian] de neige xiaogou shui le (SIOVI)
monkey for him wash-face NOM that dog sleep ASP

5.1 Methods, Subjects, Procedure

The test sentences were constructed by taking the SS, SO and SIO sentences of Experiment One and replacing the VP of these sentences with intransitive verbs. Four intransitive predicates were used: *shui le* 'sleep-ASP', *ku le* 'cry-ASP', *bi-zhe-yan* 'close-ASP-eyes' and *zaiyaotou* 'ASP-shake-head'. Two of these were two syllables in length, and the other two three syllables in length. To ensure that all the test sentences are of the same length, the two-syllable predicates were randomly selected to cooccur with the aspect-marked embedded verbs *bao-zhe* 'hug-ASP' and *bei-zhe* 'carry-on-back-ASP'. The three-syllable intransitive predicates were randomly chosen to cooccur with the embedded verbs *ti* 'kick' and *cai* 'step on', which do not have aspect marking. The SSVI and SOVI test sentences in Experiment Two were 11 syllables in length. As for the SIOVI sentences, only the two-syllable intransitive predicates were used to replace the VPs of the SIO sentences of Experiment One. The SIOVI sentences were 13 syllables in length. The 12 test sentences were randomized together with three practice sentences (see Appendix 2).

The subjects were eight 4-year-old and nine 5-year-old Mandarin-speaking children in Beijing. The experimental procedure was identical to that of the first experiment, with the test sentences recorded in a 'clear' intonation on tape. Although there were only two distinct NPs in a test sentence in Experiment Two, three toys were presented to the child which corresponded exactly to the three animals used for the transitive counterpart in Experiment One. This was necessary to see how the child interpreted the gap and the resumptive pronoun. It is conceivable that the child may identify the gap or the resumptive pronoun with an entity distinct from the referents of the two other NPs in the sentence.

5.2 Results

As can be seen from Table 6, 4-year-olds were able to respond to these sentences correctly at least 75% of the time, while the 5-year-olds were able to do so for at least 83% of the time.

We see from Table 7 that at least 75% of the 4-year-olds were able to correctly interpret SSVI and SOVI sentences 75% or more of the time. As for the SIOVI sentences, the percentage of subjects achieving criterion was 63% among the 4-year-olds, but the figure climbed to 100% in the 5-year-olds. A one-way ANOVA was

carried out for each of the two age groups with sentence type as the independent variable. The results show that none of the differences between sentence types was significant.

Table 6: Percentage of Correct Responses on Relative Clause Sentences with Intransitive Matrix Predicates

Age		SSVI	SOVI	SIOVI
4	% Correct	81	78	75
	Total Possible	32	32	32
5	% Correct	83	89	97
	Total Possible	36	36	36

Table 7: Percentage of Subjects with three or more Correct Responses On a Relative Clause Sentence Type (Sentences with Intransitive Matrix Predicates)

Age	SSVI	SOVI	SIOVI
4 (N=8)	75%	88%	63%
5 (N=9)	78%	89%	100%

5.3 Discussion

Two striking contrasts can be observed between the results in the two experiments (Tables 2-3 vs Tables 6-7). Children comprehended the SSVI, SOVI and SIOVI sentences with ease in Experiment Two, while they generally experienced difficulty with SS, SO, OS, and OO sentences in Experiment One. The lack of a significant difference in Experiment Two between results on the three sentence types also contrasts sharply with the overwhelming superiority of SS sentences over the other sentence types in Experiment One.

These differences cannot be easily accounted for by processing heuristics. Looking at the structures of the SSVI, SOVI and SIOVI sentences given in (22), we can see that the comprehension of the RC in SSVI sentences is facilitated by the Minimal Distance Principle (MDP). However, the main clauses of these two sentence types are not supported by the NVN strategy, because the sequence at the end of the sentence is NV and not NVN. This means that SSVI is supported by the parallel function strategy and the MDP, whereas SOVI is facilitated by only the MDP. In that case, the higher level of correct responses for these sentence types in the second experiment, as compared to the results for SS and SO sentences in the first experiment, should not be expected. This is because the SSVI and SOVI sentences are in fact supported by fewer strategies than SS and SO sentences in the first experiment (cf. Table 1).

(22) a. [-V NP_1] *de* N_2 V_I (SSVI)
b. [NP_1 V _] *de* N_2 V_I (SOVI)
c. [NP_1 P pro V'] *de* N_2 V_I (SIOVI)

Even if the NVN strategy is relaxed so that it can apply to NV sequences, one is still led to wrong predictions in the second experiment. Under the latter assumption, SSVI and SOVI should be no different from their counterparts in the first experiment-SS and SO. Further, one should expect to see a difference between the findings on SSVI and SOVI, since SS was superior to SO in Experiment One. Neither of these predictions is borne out by our data.

We argue that 4- and 5-year-olds do not experience any difficulty in assigning complex NP structure to the subjects of the SSVI and SOVI sentences. This is supported by two pieces of evidence. One piece of evidence comes from the error patterns in Experiment Two (see Appendix 3).

Recall that in Experiment One, SO sentences were one of the two types that differentiated the syntactic and heuristic approaches. It was hypothesized that some children segment SO sentences into two parts, so that the initial NP V NP sequence (with the RC marker ignored) will fall into the first window, and the remaining V NP form a VP in the second window. The attachment of the VP to S at the second stage of parsing will give conjoined clause readings. The same analysis should in principle apply to the SOVI sentences to give errors of the type $1V_e2$, $1V_I$. However, only one 4-year-old displayed this tendency. This suggests that the 4-year-olds analysed the [NP V_] *de* N sequence correctly as a complex NP. The greater length and complexity of the test sentences in Experiment One made it more difficult for the children to pay attention to the RC marker *de*. If, however, the cognitive demand of the task is such that it does not inhibit the perception of the RC marker, these RC sentences will not present any problem even for 4-year-olds.

The second piece of evidence comes from naturalistic studies of first language acquisition of Mandarin Chinese. Both Erbaugh (1982, in press) and Packard (1988) report that 3-year-old Chinese children are already familiar with *de* in its RC marker function. Erbaugh (in press) further reports occurrences of full-fledged RC structures such as (29) at 2:6:

(29) Baba lai de xiaogou hui yao wo
papa bring NOM dog can bite me
"The puppy which papa brought might bite me"

It appears then that some children start producing RC structures before three years of age.

Two interpretations can be proposed for the SIOVI sentences. One is that children have acquired resumptive pronoun binding by five years of age. This is evidenced by the fact that although the experimental setting allowed the child to interpret the resumptive pronoun as referring to an object not mentioned in the sentence, only one 4-year-old opted for this response. The child will first analyze [NP_1 P pro V_e'] as the first chunk, [*de* N_2] as the second, and V_I as the third The first two packages will combine to form the complex NP subject, while the third package will be the predicate. On this analysis, the difference between the SIO and the SIOVI sentences is that the length of the former made it very likely for the child to drop *de* in analyzing SIO sentences. As a result, misinterpretations are more likely to occur on SIO sentences than on SIOVI sentences.

Alternatively, one may argue that the 4- and 5-year-olds were parsing the SIO and SIOVI sentences in the same way, i.e. they assign clausal status to [NP_1 P pro V_e'], drop the RC marker *de*, and interpret the remainder of the sentence as a separate clause (cf. Fig. 3). The pronoun was then understood as coreferential with a following NP, i.e. N_2, not by any grammatical principle, but by the demands of the experimental task. In this approach, SIOVI sentences should be easier than SIO sentences because the chances of referential errors according to this scenario are smaller. Unlike the SIO sentences, only the referent of N_2 and the toy object not mentioned in the sentence can serve as potential referents for the resumptive pronoun in SIOVI sentences. The toy object was virtually disregarded by children in Experiment Two, since objects not mentioned in the test sentence were far less salient than objects which received mention.

Taking stock of the two interpretations of our findings on SIOVI sentences, we favor the first interpretation because it establishes a link between accurate perception of the RC marker and correct interpretation of RC sentences. The latter can also help account for the high level of correct responses on the SSVI and SOVI sentences. In other words, the first interpretation offers a more unified analysis of the findings of the second experiment.

5. Conclusions

In this paper, we have argued that non-syntactic processing strategies are inadequate to account for the comprehension of sentences containing relative clauses by Mandarin-speaking children aged between 4 and 8. Processing heuristics such as the Parallel Function Hypothesis, the Minimal Distance Principle (MDP) and the NVN strategy make the wrong predictions about relative order of difficulty of the sentence

types SS, SO, OS, and OO in Chinese, and cannot be extended to cover cases of relativization involving resumptive pronouns (i.e. the SIO and OIO types).

Based on Frazier and Fodor (1978)'s two-stage parsing model, we argue that children found SS significantly easier than the other sentence types because of reanalysis of the RC as adverbial clause and the availability of backwards zero anaphora in the language. OO and OIO sentences were the most difficult, as the lexical NP in the RC falls in the same parsing window as the matrix subject and verb. Given the constraints of the parsing model, misanalysis is bound to occur. Contrary to expectation, OS and SIO sentences did not present severe problems. In the case of OS sentences, the factor responsible for this result may have been the probibition against verbal coordination in Chinese. As for the SIO sentences, we propose that the presence of an overt pronominal form and the Binding Principles helped minimize errors on this sentence type. As a result of the above pattern of findings, left-branching sentences (SS, SO, SIO) were significantly easier than sentences involving center-embedding (OS, OO, OIO). Sentences involving subject relativization (SS, SO) were significantly easier than those involving either object relativization (SO, OO) or indirect object relativization (SIO, OIO), a finding consistent with the Keenan and Comrie Accessibility hierarchy but contradicting the Hakuta (1981) conjecture. However, the Parallel Function hypothesis was not confirmed: it was not generally true that SS and OO sentences as a whole were significantly easier than SO and OS sentences.

Our findings also indicate that children as young as four have acquired the complex NP structure containing RCs, demonstrating a grasp of the relationship between the head noun and the gap in the RC. When the matrix predicate was changed to an intransitive verb, with the length and complexity of the test sentence reduced, 4-year-olds had no difficulty with SS and SO sentences, and children by 5 years of age showed good comprehension of the binding of resumptive pronouns in SIO sentences. In addition, no significant difference was found in the children's performance with respect to the three sentence types at either of the age levels. It is hypothesized that the reduction of complexity of the matrix sentence made it easier for the children to perceive the RC marker *de*, which led to significant improvement in their comprehension of the sentences containing RCs.

Notes

1 Strictly speaking, in order to apply the MDP, one needs to know that the missing gap is the subject of a complement clause or a relative clause (cf. Chomsky 1969, M.Smith 1974). But once this prerequisite is satisfied, the condition for identifying the antecedent makes no reference to syntactic structure.

2 Since most of these studies tested for significance of difference between pairs of sentence types (e.g. SS/SO vs OS/OO or SS/OO vs SO/OS) for the child subjects as a

group, it is not clear whether the differences were significant for individual age groups. Here we are relying on either mean scores or the number of correct responses for various ages. One study, Abrahamsen & Rigrodsky (1984), classified subjects according to cognitive stages. The mean ages of the three groups studied were approximately 6;7, 9;7 and 12;6. It should also be noted that these studies generally did not include as a factor the humanness of the shared noun phrase. Humanness may be relevant to relative clause acquisition in view of recent studies of the distribution of relative clauses in adult American English (e.g. the tendency for the shared NP in SO sentences to represent nonhuman referents, cf. Fox and Thompson 1990).

3 It has been proposed that the distinction between restrictive and non-restrictive relative clauses hinges on the ordering of the determiner phrase, the relative clause and the head noun (Chao 1968). The order RC-*de*-DET-N marks a restrictive RC while the order DET-RC-*de*-N signals a non-restrictive RC. Not all Chinese linguists agree on the validity of this formal distinction since native speakers do not have sharp intuitions on it. Teng (1987) argues that all relative clauses in Chinese carry a restrictive function, as evidenced by the restrictions against having pronouns or proper names as head nouns. Huang (1982), however, adduces support for the alleged formal distinction from appositional contexts in which only the order DET-RC-*de*-N is possible. In the English glosses, NOM=nominalizer.

4 The Parallel Function Hypothesis has also been disconfirmed by data from German (Mills 1975), though the experimental task used in that research was a picture identification task.

5 This feature of the embedded verb is also true of the test sentences involving indirect object relativization in the de Villiers et al (1979) study, in which intransitive predicates such as verbs of communication *shout to, yell to* were used. To use a prototypical dative structure (e.g. X give Y to Z) in the RC of test sentences will mean introducing more toy objects, i.e. 4 animals instead of 3. This will increase the cognitive demand of the task.

6 In addition, 6 control sentences were included, divided evenly into three categories corresponding to the SO, OO and SIO types. The control sentences consisted of conjoined structures which differed minimally from the corresponding SO, OO, SIO sentences, in that the RC marker *de* was omitted from the sentences, as in (a-c) (see also Appendix I). They were identical in length and prop setting to their experimental counterparts.

(a) xioxiong bao neige baitu ti neige houzi (SOC)
teddy-bear hug that rabbit kick that monkey
"The teddy-bear hugs the rabbit (and) kicks the monkey"

(b) baitu bei neige xiaoxiong ti neige houzi (OOC)
rabbit carry-on-back that teddy-bear kick that monkey
"The rabbit carries on its back the teddy-bear (and)
kicks the monkey"

(c) houzi gei ta xi-le-lian neige xiaogou qian zhe xiaoxiong
monkey for him wash-face that puppy hold-hand ASP teddy-bear
"The puppy washed his face for him (and) the puppy holds
the teddy-bear's hands"

Control sentences for SS, OS, OIO types were not included, because they could not be easily transformed into minimally different conjoined sentences. To compensate for length, the aspect markers were omitted from the control sentences, but the determiner *neige* 'that' was added to one of the NPs in the control sentences, to produce conjuncts that were maximally similar in structure.

7 It was assumed that the child would understand the meanings of these verbs which presumably frequently occur in speech to children by caretakers. A pre-test for verb meaning was not carried out as we found in pilot sessions that asking the subjects to act out individual verbs misled them into thinking that only one action was needed for the test sentence. If the child did not fully understand the verb, which hardly happened, the experimenter would demonstrate the action to the child and then the test sentence would be repeated.

8 The subjects' performance on the control sentences generally surpassed that of their corresponding experimental sentences for the same age group. To ascertain the significance of the difference between the experimental and control sentences, a t-test was carried out by comparing the subjects' total score on the two experimental sentences corresponding to the control sentences of the same type to their total score on the control sentence counterparts. It is clear that for OO sentences, the differences between the experimental and control sentences were significant for all age groups. This is also true of the SIO sentences for the 5-, 6- and 7-year-olds. However, except for the 6-year-olds, the difference between experimental and control sentences was generally not significant for the SO types. The results are shown in Table 8:

Table 8: Mean Scores of Experimental and Control sentences (Total Possible= 2)

Age	SO		OO		SIO	
	Experimental	Control	Experimental	Control	Experimental	Control
4	0.67	1.33	0.08	0.83*	0.25	0.58
5	0.58	1.33	0.08	1.17**	0.33	1.00**
6	0.58	1.42*	0.08	1.25**	1.00	1.50*
7	1.31	1.46	0.23	1.23**	1.15	1.85*
8	1.75	1.58	0.58	1.75**	1.50	1.83

*means a significant difference was found by the t-test, $p<.05$;
**means a significant difference was found by the t-test, $p<.01$.

9 Criticisms have been raised against the length constraint of the two-stage parsing model of Frazier and Fodor's. Milsark (1983), for example,argues that additional constraints may be involved in parsing which may not be derivable from the length constraint. Thus, a sentence such as "John said that Bill died yesterday' favors the reading in which the time adverb associates with the lower clause, although the length of the sentence should allow it to fall within one window. I assume that the modifications proposed in Fodor and Frazier (1980) may be necessary, but the details will not affect my analysis.

10 In this study, V_e represents embedded verb, V_m main verb; aV_eb, pV_mq represents a response in which the action described by the embedded verb goes from the entity denoted by NP_a to that denoted by NP_b, and the action described by the main verb goes from the entity denoted by NP_p to that denoted by NP_q.

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Appendix 1:Test Sentences of Experiment 1

SS Sentences: [_ V NP_1] de N_2 V NP_3

SS1: [_ bao zhe xiaoxiong] de neige baitu ti houzi
hug ASP teddy-bear NOM that rabbit kick monkey
"The rabbit that is hugging the teddy-bear kicks the monkey"

SS2: [_ bei zhe houzi] de neige xiaoxiong cai xiaogou
carry-on-back ASP monkey NOM that teddy-bear step-on puppy
"The teddy bear that is carrying the monkey on its back
steps on the puppy"

SS3: [_ ti baitu] de neige xiaògou bei zhe houzi
kick rabbit NOM that puppy carry-on-back ASP monkey
"The puppy that kicks the rabbit is carrying the monkey on its back"

SS4: [_cai xiaogou] de neige houzi bao zhe xiaoxiong
step-on puppy NOM that monkey hug ASP puppy
"The monkey that steps on the puppy is hugging the puppy"

SO Sentences: [NP_1 V _] de N_2 V NP_3

SO1: [xioxiong bao zhe_] de neige baitu ti houzi
teddy-bear hug ASP NOM that rabbit kick monkey
"The rabbit that the teddy-bear is hugging kicks the monkey"

SO2: [houzi bei zhe_] de neige xiaoxiong cai xiaogou
monkey carry-on-back ASP NOM that teddy-bear step-on puppy
"The teddy bear that the monkey is carrying on its back
steps on the puppy"

SO3: [baitu ti_] de neige xiaogou bei zhe houzi
rabbit kick NOM that puppy carry-on-back ASP monkey
"The puppy that the rabbit kicks is carrying the monkey on its back"

SO4: [xiaogou cai_] de neige houzi bao zhe xiaoxiong
puppy step-on NOM that monkey hug ASP puppy
"The monkey that the puppy steps on is hugging the puppy"

OS Sentences: NP_3 V [_ V NP_1] de N_2

OS1: baitu bei zhe [_ti xiaoxiong] de neige houzi
rabbit carry-on-back ASP kick teddy-bear NOM that monkey
"The rabbit is carrying on its back the monkey that kicks
the teddy bear"

OS2: xiaogou bao zhe [_cai baitu] de neige xiaoxiong
puppy hug ASP step-on rabbit NOM that teddy-bear
"The puppy is hugging the teddy bear that steps on the rabbit"

OS3: xiaogou cai [_bao zhe houzi] de neige baitu
puppy step-on hug ASP monkey NOM that rabbit
"The puppy steps on the rabbit that is hugging the monkey"

OS4: houzi ti [_bei zhe xiaogou] de neige xiaoxiong
monkey kick carry-on-back ASP puppy NOM that teddy-bear
"The monkey kicks the teddy-bear that is carrying the puppy
on its back"

OO Sentences: NP_3 V [NP_1 V_] de N_2

OO1: baitu bei zhe [xiaoxiong ti_] de neige houzi
rabbit carry-on-back ASP teddy-bear kick NOM that monkey
"The rabbit is carrying on its back the monkey that
the teddy bear kicks"

OO2: xiaogou bao zhe [baitu cai_] de neige xiaoxiong
puppy hug ASP rabbit step-on NOM that teddy-bear
"The puppy is hugging the teddy bear that the rabbit steps on"

OO3: xiaogou cai [houzi bao zhe_] de neige baitu
puppy step-on monkey hug ASP NOM that rabbit
"The puppy steps on the rabbit that the monkey is hugging"

OO4: houzi ti [xiaogou bei zeh] de neige xiaoxiong
monkey kick puppy carry-on-back NOM that teddy-bear
"The monkey kicks the teddy-bear that the puppy
is carrying on its back"

SIO Sentences: [NP_1 P pro V'] de N_2 V NP_3

SIO1: [xiaoxiong gen ta zhaoshou] de neige houzi gen zhe baitu
teddy-bear at him wave-hand NOM that monkey follow ASP rabbit
"The monkey at whom the teddy bear waves its hands follows
the rabbit"

SIO2: [houzi gei ta xilian] de neige xiaogou qian zhe xiaoxiong
monkey for him wash-face NOM that puppy hold-hand ASP teddy-bear
"The puppy for whom the monkey is washing his face is holding
the teddy-bear's hands"

SIO3: [xiaogou ti ta shuaya] de neige baitu gen zhe xiaoxiong
puppy for him brush-tooth NOM that rabbit follow ASP teddy-bear
"The rabbit for whom the puppy is brushing his teeth follows
the teddy-bear"

SIO4: [baitu xiang ta jingli] de neige xiaogou qian zhe houzi
rabbit to him salute NOM that puppy hold-hand ASP monkey
"The puppy to whom the rabbit salutes is holding the monkey's hand"

OIO Sentences: NP_3 V [NP_1 P pro V'] de N_2

OIO1: baitu gen zhe [xiaoxiong gen ta zhaozhou] de neige houzi
rabbit follow ASP teddy-bear at him wave-hand NOM that monkey
"The rabbit follows the monkey at whom the teddy-bear waves its hands"

OIO2: xiaoxiong qian zhe [houzi gei ta xilian] de neige xiaogou
teddy-bear hold-hand ASP monkey for him wash-face NOM that puppy
"The teddy bear is holding the hands of the puppy for whom the
monkey is washing his face"

OIO3: xiaoxiong gen zhe [xiaogou ti ta shuaya] de neige baitu
teddy-bear follow ASP puppy for him brush-tooth NOM that rabbit
"The teddy-bear follows the rabbit for whom the puppy is brushing
his teeth"

OIO4: houzi qian zhe [baitu xiang ta jingli] de neige xiaogou
monkey hold-hand ASP rabbit to him salute NOM that puppy
"The monkey is holding the hands of the puppy to whom the rabbit salutes"

Control Sentences:

SO Control Sentences: NP_1 [V NP_2] [V NP_3]

SO1C: xioxiong bao neige baitu ti neige houzi
teddy-bear hug that rabbit kick that monkey
"The teddy-bear hugs the rabbit (and) kicks the monkey"
SO2C: houzi bei neige xiaoxiong cai neige xiaogou
monkey carry-on-back that teddy-bear step-on that puppy
"The monkey carries on its back the teddy-bear (and)steps on the puppy"

OO Control Sentences: NP_3 [V NP_1] [V NP_2]
OO1C: baitu bei neige xiaoxiong ti neige houzi
rabbit carry-on-back that teddy-bear kick that monkey
"The rabbit carries on its back the teddy-bear (and) kicks the monkey"
OO2C: xiaogou bao neige baitu cai neige xiaoxiong
puppy hug that rabbit step-on that teddy-bear
"The puppy hugs the rabbit (and) steps on the teddy-bear"

SIO Control Sentences: [NP_1 P pro V'] [NP_2 V NP_3]
SIO1C: xiaoxiong gen ta zhao-le-shou neige houzi gen zhe baitu
teddy-bear at him wave-ASP-hand that monkey follow ASP rabbit
"The teddy-bear waved his hand at him (and) the monkey follows
the rabbit"
SIO2C: houzi gei ta xi-le-lian neige xiaogou qian zhe xiaoxiong
monkey for him wash-face that puppy hold-hand ASP teddy-bear
"The puppy washed his face for him (and) the puppy holds
the teddy-bear's hands"

Appendix 2: Test Sentences of Experiment 2

SSVI Sentences: [_V NP_1] de N_2 V_I

SS1VI: [_ bao zhe xiaoxiong] de neige baitu shui le
hug ASP teddy-bear NOM that rabbit sleep ASP
"The rabbit that is hugging the teddy-bear has fallen asleep"

SS2VI: [_ bei zhe houzi] de neige xiaoxiong ku le
carry-on-back ASP monkey NOM that teddy-bear cry ASP
"The teddy bear that is carrying the monkey on its back cried"
SS3VI: [_ ti baitu] de neige xiaogou zai yaotou
kick rabbit NOM that puppy ASP shake-head
"The puppy that kicks the rabbit is shaking (its) head"
SS4VI: [_cai xiaogou] de neige houzi bi zhe yan
step-on puppy NOM that monkey close ASP eye
"The monkey that steps on the puppy is having (its) eyes closed"

SOVI Sentences: [NP_1 V _] de N_2 V_I
SO1VI: [xioxiong bao zhe_] de neige baitu shui le
teddy-bear hug ASP NOM that rabbit sleep ASP
"The rabbit that the teddy-bear is hugging has fallen asleep"
SO2VI: [houzi bei zhe_] de neige xiaoxiong ku le
monkey carry-on-back ASP NOM that teddy-bear cry ASP
"The teddy bear that the monkey is carrying on its back cried"
SO3VI: [baitu ti_] de neige xiaogou bi zhe yan
rabbit kick NOM that puppy close ASP eye
"The puppy that the rabbit kicks is having its eyes closed"
SO4VI: [xiaogou cai_] de neige houzi zai yaotou
puppy step-on NOM that monkey ASP shake-head
"The monkey that the puppy steps on is shaking its head"

SIOVI Sentences: [NP_1 P pro V'] de N_2 V_I
SIO1VI: [xiaoxiong gen ta zhaoshou] de neige houzi shui le
teddy-bear at him wave-hand NOM that monkey sleep ASP
"The monkey at whom the teddy bear waves its hands has fallen asleep"
SIO2VI: [houzi gei ta xilian] de neige xiaogou shui le
monkey for him wash-face NOM that puppy sleep ASP
"The puppy for whom the monkey is washing his face has fallen asleep"
SIO3VI: [xiaogou ti ta shuaya] de neige baitu ku le
puppy for him brush-tooth NOM that rabbit cry ASP
"The rabbit for whom the puppy is brushing his teeth cried"
SIO4VI: [baitu xiang ta jingli] de neige xiaogou ku le
rabbit to him salute NOM that puppy cry ASP
"The puppy to whom the rabbit salutes cried"

Appendix 3

Table 10: Types of Consistent Errors. Number of Subjects Showing At Least Two Tokens of an Error Type[a]

Age	SS [_VNP$_1$]deN$_2$VNP$_3$		SO [NP$_1$V_]deN$_2$VNP$_3$	OS NP$_3$V [_VNP$_1$]deN$_2$		OO NP$_3$V[NP$_1$V_]deN$_2$	
Error Type	2V$_e$1,1V$_m$3	1V$_e$2,1V$_m$3	1V$_e$2,1V$_m$3	3V$_e$1,3V$_m$2	3V$_e$2,3V$_m$1	3V$_e$2,3V$_m$1	1V$_e$2,3V$_m$1
4 (N=12)	2	1	4	5		5	1
5 (N=12)		1	7	2	2	8	
6 (N=12)			10	1	4	9	1
7 (N=13)			7	3	1	10	2
8 (N=12)			3	1		7	1

Age	SIO [NP$_1$PproV']deN$_2$VNP$_3$			OIO NP$_3$ V [NP$_1$ Ppro V']de N$_2$			
Error Type	1V$_e$3,2V$_m$3	1V$_e$2,1V$_m$3	2V$_e$3,3V$_m$1	2V$_e$1,3V$_m$1	1V$_e$2,3V$_m$1	2V$_e$31,1V$_m$3	2V$_e$3,1V$_m$3	2V$_e$1,3V$_m$2
4 (N=12)	3	1		1			1	
5 (N=12)	3		2				2	
6 (N=12)	2	1	3	2	2			1
7 (N=13)	3		7	4		2		1
8 (N=12)	2		5		1			

[a] Error types unique to a single individual in the sample have not been included in this table. V_e = embedded verb; V_m= main verb; aV_eb, pV_mq represents a response in which the action described by the embedded verb goes from the entity denoted by NP$_a$ to that denoted by NP$_b$, and the action described by the main verb goes from the entity denoted by NP$_p$ to that denoted by NP$_q$. The order in which the MC and RC responses are listed may not correspond to the order of act-out.

Table 11: Types of Consistent Errors. Number of Subjects Showing At Least Two Tokens of an Error Type (Sentences with Intransitive Matrix Predicates)[a]

Age	SSVI [_VNP$_1$]deN$_2$ V$_I$		SOVI [NP$_1$V _]deN$_2$ V$_I$	SIOVI [NP$_1$ PproV']deN$_2$ V$_I$		
Error Type	2V$_e$1,1V$_I$	1V$_e$2,2V$_I$	1V$_e$2,1V$_I$	1V$_e$2,1V$_I$	1V$_e$3,2V$_I$	2V$_e$1,2V$_I$
4(N=8)	1	1	1	1	1	1
5(N=9)	2					

[a] V$_I$=intransitive matrix predicate , V$_e$=embedded verb

《從漢語關係子句之獲得看『語言處理策略』理論之不足》

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本文研究四至八歲說北京話的兒童如何理解含有關係子句的句子。論文報告兩個實驗調查，其中研究的變項是：(一) 同指稱名詞組在主句中的語法功能（主語或賓語）；（二）同指稱名詞組在關係子句中的語法功能（主語、直接賓語、或間接賓語）。

結果顯示：同指稱名詞組 (coreferential NP) 爲主語或賓語的關係子句，四歲小孩已能掌握；涉及保留代詞(resumptive pronoun)、同指稱名詞組爲間接賓語的關係子句，小孩到五歲就能理解。

本文論証，要充份解釋北京話的關係子句獲得材料，一定得依靠句法特徵；僅用『語言處理策略』理論，是不足夠的。

The Translatability of Law

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1. Introduction

Objections, or rather resistance, of some local prominent lawyers to the use of Chinese in the courts have raised a number of significant issues concerning the translatability of the Common Law into Chinese, and for that matter, the translatability of law in general. If the Common Law is, as they have maintained, inseparable from the English language, the whole bilingual laws project is futile and bilingual legislation is simply a hopeless enterprise. The future of Hong Kong's legal system will then be at stake.

The claim that the Common Law is inaccessible to any language other than English has been forcefully refuted by Professor Derek Roebuck (1989, 1990a, 1990b, 1990c). Having charted its historical development in England, he pointed out the hard fact that "for most of its formative period, the Common Law was transacted in three languages: Latin, French and English" He added (1990b):

> Latin was never a spoken language of the Common Law. Its use as a spoken language in England was minimal outside religious ritual. It was, however, the language of record for most purposes of the Common Law, from soon after the Norman Conquest to the eighteenth century, with slight interruptions--a period of seven hundred years. French was the ordinary language of lawyers, spoken and written, for some centuries. At its demise, it was suggested...that if the legal system went into the [English] vernacular, the Common Law would not survive.

So history is repeating itself here in Hong Kong. And if we are not too reluctant to learn from history, we can see that our lawyer-opponents' claim is no more than a myth. For if what is now known as the Common Law could go through and survive a linguistic transformation before, it is totally inconceivable why it is now incapable of taking on and surviving in another linguistic form. However, the viability of the bilingual laws project presupposes more than the mere expressibility of the Common Law in Chinese. It also presupposes the possibility of achieving semantic equivalence between the English and the Chinese versions. As can be seen easily, the first presupposition is a much weaker one than the second. All it requires is that the Common Law can be expressed in Chinese, without saying anything about the extent to which it can be so expressed. And its plausibility is supported by the historical fact mentioned above. The second presupposition requires an exact translation of the Common Law into Chinese, an extremely high requirement even many of those who endorse the expressibility idea would frown upon. Yet it is a necessary and reasonable requirement of bilingual legislation. To operate properly under the system of bilingual legislation, the law must ensure that both its versions convey the same legal message to the two language communities concerned. If the Chinese version can only partially express what its English counterpart intends to convey, the law will not be able to regulate the behaviour of the Chinese community in exactly the same way in which it regulates the behaviour of the English community. This will inevitably lead to innumerable disputes, if not chaos.

I am convinced that semantic equivalence in legal translation and bilingual legal drafting can be achieved. I have tried elsewhere to outline a methodology which enables us to achieve what we want to achieve under bilingual legislation (1988, 1989, 1990). In this paper I shall examine three arguments against the possibility of semantic equivalence and show that none of them succeeds in justifying the untranslatability of law. I shall also spell out the true nature of translating the Common Law into Chinese and conclude by noting its implications for Hong Kong's legal system. As my main concern here is with the theoretical aspects of the issues, I shall not get down to the nitty-gritty of legal translation and content myself with a few examples. I hope that this paper can help remove some of the misgivings about the viability of transplanting the Common Law in the Chinese language, whether in the form of a digest, or through translating or drafting.

As can be seen, the whole problem of translatability hinges upon the concept of semantic equivalence, the clarification and understanding of which can best be achieved within a framework built upon linguistics and the philosophy of language. This paper is also written to show that theoretical studies in linguistics and the philosophy of language can and do have a direct bearing on issues of a more practical nature. After all, it needs little insight to note that the more we understand the nature and workings of language, the better we can use it to serve us. And it is exactly in this respect that the study of linguistics and the philosophy of language can make its contributions.

2. Arguments against the possibility of exact translation

2.1 The argument from inseparability of content from form

The argument which gives our lawyer-opponents the strongest support is the one which insists on the impossibility of dissociating what is expressed in a language (content) and how it is expressed in that language (form). In this view, meaning changes whenever sign changes. Werner Winter, one of the proponents of impossibilities of translation, bases the argument on his observations of the nature of language. He says (1961):

Lee, T. (ed.) 1992, *Research on Chinese Linguistics in Hong Kong*, pp. 86 - 100. Hong Kong: The Linguistic Society of Hong Kong.

> Languages are systems of arbitrarily selected, but conventionalized, signs which serve to convey arbitrarily selected, but conventionalized, meanings.

He goes on to make the following remarks (1961):

> One, sign and meaning cannot be dissociated from one another; an utterance, a sound or a sequence of sounds, is part of a language only if it is employed in signaling a reference to something different in substance from the mere physical utterance; a meaning does not exist in itself, but only insofar as it becomes manifest in a linguistic feature.
> Second, signs and what they stand for owe their existence to arbitrary selection and their preservation to conventionalization of this selection; the arbitrary origin makes for almost unlimited diversity which is reduced only when languages are related to one another in a broad historical sense, covering both genetic and contact relationships.
> Third, no sign and no meaning exists by itself, but only as part of a system.

From these observations he draws two conclusions (1961):

> [One], [w]hile languages may be similar to each other, they are never identical....The system of form and meaning in Language A may be similar to that in Language B, but is never identical with it.
> [Second], **[t]here is no completely exact translation.** If an interpretation of reality as formulated in Language A does not exist in any isolation, but only as part of the system total of this language, then its correlative in Language B cannot be isolated from the overall system of B, which must be different from that of A.

Winter's view of language is one of conventionalism and holism. Conventionalism holds that language, as one of the sign systems created by human beings, is the conventionalization of a set of arbitrary sign-meaning relationships, whereas holism maintains that each of these relationships exists not in isolation but as part of the system to which it belongs. I think that we can accept both these views without accepting Winter's argument. For neither entails the impossibility of exact translation.

First, to say that sign-meaning relationship is arbitrary is the same as to say that a particular meaning is not necessarily connected with a particular sign. If we can arbitrarily select a sign to convey an arbitrarily selected meaning, we can always arbitrarily select another sign to convey that particular meaning. Thus it is always possible for a particular meaning to be conveyed by more than one sign. In other words, it is always possible for two or more signs to have exactly the same meaning. This is logically entailed by conventionalism and accords with our common sense view

of meaning. And it is in this sense that meaning can be said to be capable of being dissociated from sign. Even Winter admits that an utterance or a sound is employed to signal a reference to "something different in substance" from the mere physical utterance or sound. That something is therefore not physically inseparable from the utterance or sound. It follows that two or more utterances or sounds can be used to refer to the same thing, which is again just common sense.

What Winter means by the statement "Sign and meaning cannot be dissociated from one another" is equivocal. On the one hand, he means by this that meaning cannot exist in itself, an anti-realist view which we can accept. On the other hand, he means that meaning is essentially bound up with what he calls "form", i.e., the way in which it is conveyed and that "if forms differ, **a priori**, semantic equivalence cannot be expected" (1961). To illustrate this point, he uses as an example the number "90" as expressed in "closely related languages":

> In English, the numeral used would be **ninety**, with formal indication that the semantic unit 90 is to be analyzed as `nine decadic units'. When we turn to Russian **devianosto**, the form suggests a very similar, but not identical interpretation, viz., `nine decadic units, one unit away from one hundred'.... French **quatre-vingt-dix** requires a quite different analysis, namely, `four score and ten', and Danish **halfems**, finally, has to be paraphrased as `half of the fifth score', with the type of elliptic formulation as found in German **anderthalb** `half of the second' = `one and one half'.

Obviously, no one would disagree with Winter that these are **different** ways of expressing **the same number "90"**: the forms are different but they refer to the same number. That all these different expressions can be said to have the same meaning in an important sense of the word "meaning" can be seen from the fact that we can equate them with one another without distorting their meaning. Thus we can have the following equation:

ninety = devianosto = quatre-vingt-dix = halfems

If these expressions did not display what is generally known as "semantic equivalence", the above equation would be a contradiction. Since hardly anyone would think that, there must be something wrong about Winter's idea of the impossibility of semantic equivalence. If Winter wants to make his point, he must show that the different expressions do not mean the same number, and that there is not a single "90" to which these different expressions refer. He must also accept the obviously absurd conclusion that the system of number varies from language to language. The expression "different ways of saying the same thing" must then be struck out of Winter's language.

The root of Winter's fallacy lies in his failure to distinguish between the various types of meaning. Using "meaning" as a generic term to cover every possible aspect of

meaning, Winter commits himself to the view that for two expressions to be semantically equivalent, they must be identical in every possible aspect of meaning. The only situation where two expressions can meet this requirement is that the two expressions are one and the same expression in the same language, e.g., ninety = ninety. In Winter's view, semantic equivalence is by definition impossible except for self-identical expressions. For him the only possible exact translation of "ninety" is "ninety". Obviously, this is too trivial a view for anyone to hold if one wants to conduct a fruitful inquiry into the nature of semantic equivalence. A fruitful inquiry should be guided by a clear purpose and semantic equivalence should be investigated in the light of the aspect or aspects of meaning relevant to the inquiry. I shall return to this.

Presumably Winter does not know Chinese. The Chinese numeral for 90 is `jiushi' ( 九十 ), which means exactly the same as the English `ninety', i.e., `nine decadic units'. As a matter of fact, the number system of Chinese matches perfectly with that of English up to 9,999 (except for differences in sound and writing, of course!). The fact that Chinese and English are two different languages does in no way prevent them from having perfect matches in part of their number systems. Even Winter admits himself that "one-to-one correspondences are possible as long as one confines oneself to utterances of limited size outside a larger context" , though he does not hesitate to add that "but this observation does not invalidate the overall statement [that there is no completely exact translation]" [10]. Why not? That statement is falsified in two respects. One, there is ample factual evidence to show that one-to-one correspondences between languages do exist. Look in the areas of natural sciences, mathematics, logic, technology, games and sports and we can see that one-to-one correspondences exist not only in confined contexts of limited sizes. Second and more important, the very fact that there are one-to-one correspondences, whatever the amount, suffices to prove that completely exact translation is **not impossible**. What Winter and many others have committed here is the common fallacy of division. They argue fallaciously that what is true of the whole must be true of its parts: because Languages A and B are different, all their parts must be different; and because all their parts are different, completely exact translation cannot exist between Languages A and B. The whole argument is of course invalid.

2.2 Argument from imprecision of language

Another argument against the possibility of exact translation is put forth by Edward L. Keenan (1978). For a language to be a possible human language, he argues, it must meet what he calls the **Efficiency Requirement (ER)** (1978, 160):

> A human language must permit the communication of thoughts in a way that is reasonably efficient relative to the lifespan and cognitive capabilities of human beings.

A language in which every sentence has more than a trillion words would not permit efficient communication because, to use Keenan's example, it would take years just to

say `You're standing on my foot' (1978, 160). To facilitate efficient communication, a language must be of a limited size in respect of vocabulary, syntax, etc., but at the same time it must allow us to talk about an unlimited range of phenomena in an even more diverse range of communication situations (1978, 160-1). From this Keenan concludes that human languages are by nature **imprecise** and "consequently, as a norm, a speaker does not express his thought **exactly**" (1978, 160). Since human languages are imprecise and since human thoughts are inexact, human languages are not exactly translatable.

The force of Keenan's argument rests entirely upon his equivocal use of the word "imprecise". When he says that human languages are by nature imprecise, he means that human languages do not explicitly code all the information required for and involved in verbal communication. The sentence "John told Bill that he was sick" does not tell us whether the pronoun "he" refers to John, Bill or someone else (1978, 161), and the word "bachelor" does not tell us whether it means "unmarried man", "male seal", "knight's helper" or "recent college graduate" (1978, 162). No one would argue with Keenan here, as this is a very trivial point. No language can explicitly code by means of its linguistic features all the information involved in an unlimited range of communication situations. To expect from human languages that kind of precision is mere chimera. Keenan is well aware of this. He even points out that imprecision (in that sense) is "most usually not a communication hindrance, since the speaker can usually count on the independent knowledge of the addressee to grasp his thought **exactly**" (1978, 161). "Language imprecision," he claims, "facilitates communication efficiency" (1978, 161).

But this is not what "imprecision" means in its ordinary usage. To say that human languages are by nature imprecise in the ordinary sense of the word is to say that human languages do not permit us to give accurate, definite or exact descriptions of things or to convey exact thoughts. This is obviously false. Human beings do often use languages to give accurate descriptions of things and to convey exact thoughts, or else civilization may not be what it is now. Despite the kind of imprecision Keenan has in mind, language, when properly used, does enable us to achieve in communication precision, accuracy, definiteness, exactness, and above all, truth. Language does not and cannot function all by itself. It must function together with extra-linguistic elements, and it becomes intelligible to us only when we input the necessary information. Keenan is absolutely right in pointing out that we can usually count on people's filling in the missing elements of our speech to grasp our thought exactly, because this is how precision is achieved in verbal communication. Thus, Keenan is actually saying that language imprecision does in no way preclude precision from verbal communication. Precision is in fact not a quality of language, but a quality of language performance. No word or sentence is precise in itself. But a word or sentence can be used precisely or imprecisely. By the same token, no translation is exact in itself. A translation becomes exact only when the reader is prompted to grasp the intended message by supplying the missing elements. An exact translation is one which provides all the linguistic mechanism needed to prompt the reader, or rather the right kind of reader, to do so. If imprecision (in Keenan's sense) is not a communication hindrance, it is not a translation hindrance either. For translation is just one form of communication.

As a passing remark, I want to point out that to meet the Efficiency Requirement, not only must a language not be too big and complex in its sound system, vocabulary and syntax. It must not be too small and simple either. A language which has only one word, one sound and no systax could hardly faciliate communication efficiency as its intelligibility would have to depend almost entirely on the input of a tremendous amount of necessary information, if not guesswork, by the addressee, so much so that he can never be sure whether he understands it correctly. The diagrams of I-Ching would be a good example as they could be used to mean anything without the explanatory texts. My point is: the richness of our vocabulary and the complexity of our syntax have resulted partly from our need to achieve precision for some important purposes. And precision is always one of the factors which facilitate communication efficiency. It is of course true that we do not always have to be precise in order to effect communication. To tell you that China has a population of about 1.2 billion will suffice to give you a clear idea of the population size of China if **that** is what you want to know. However, it does not mean that we must never be precise in order to facilitate communication efficiency. Quite on the contrary, efficient communication very often requires precision. When asked about the number of people in the family, one just cannot tell the census taker that there are about six or seven. Legal translation aims for precision. As has been shown, the arguments considered so far have failed to establish the impossibility of precision in translation.

2.3 Argument from semantic-syntactic gaps

It is a well-known fact that vocabulary and syntax (let alone speech sounds) vary from language to language. The existence of radically different colour and kinship terminologies among languages has led many to believe in what is known as "linguistic relativism", the claim that each language shapes a different reality for its speakers and that different languages are not commensurable and hence not translatable.

The controversies of linguistic universalism vs. linguistic relativism, commensurability vs. incommensurability of languages and scientific theories, and determinacy vs. indeterminacy of translation have been heatedly debated among linguists, philosophers of science and language, and sometimes among translators (who normally just get on with their job without bothering themselves about these theoretical issues). I do not intend to go into the details of the arguments and counter-arguments here. Suffice it to say that all the issues, like most others, simply boil down to confusion and disagreement about the basic concepts involved. The issue of semantic-syntactic gaps well exemplifies the nature of the problems.

Hardly anyone would deny that there are indeed semantic-syntactic gaps between languages. It is often the case that Language A has a word for which Language B has no syntactically unanalyzable equivalent. Eskimo is reported to have a word for snow that has been partially melted and then refrozen (Keenan 1978, 174), whereas English lacks a single-word equivalent. Similarly, the syntax of Language A permits its speaker to

express an idea in a way not permitted by that of Language B. Chinese has the straightforward question form "diji (第幾)" [meaning ?th] for eliciting ordinal numbers and permits one to elicit the answer "I was the **third** one who went in" by asking "*Ni shi diji ge jin qu de*?" (你是第幾個進去的?) [You + be + ?th + classifier for person + go + in + particle]. There does not seem to be such a question form for eliciting ordinals in English. These are what people call "gaps". But are they really unbridgeable? Does the expression "snow that has been partially melted and then refrozen" not give us a clear idea about what kind of snow the Eskimo word refers to? Does the funny expression "?th" not give my English reader a clear idea of what the Chinese question form is used for?

The existence of semantic gaps only shows that different languages have different ways of organizing the semantic fields of their basic vocabularies. Although there are hardly one-to-one correspondences between them, a simple predicate in one language can almost always be mapped onto several correlative predicates in another. The Eskimo case well illustrates this. As has been shown, the Eskimo word in question can be exactly translated into an English phrase. The lack of a single English word for that particular kind of snow by no means indicates that "English ha[s] no way to reference such snow and no way to translate exactly the relevant Eskimo sentences" (Keenan 1978, 174). The coining of a new English word for such snow does not, in this particular case, augment its expressive power. For before the coining of a new word English could already reference such snow by means of description. The coinage is merely an abbreviation and enables English to reference such snow in a simpler way.

Likewise, the existence of syntactic gaps only shows that different languages have different rules for generating acceptable formal structures, which are simply habitual ways of ordering phrasal and sentential components. The lack of a straightforward question form for eliciting ordinals does not prevent English from doing so by some other means. The Chinese question form "diji" merely signifies a particular way of eliciting ordinals and its meaning consists just in this function. If the meaning of "diji" can be conveyed by the funny expression "?th" or by the proper description "question form for eliciting ordinals", it would be a poor argument to say that since English does not have exactly the same form for eliciting ordinals, "diji" does not have an exact translation in English. For that would amount to arguing that since English people do not normally use chopsticks at meals, they are never able to pick up food from their plates.

Accordingly, all examples of semantic-syntactic gaps only show that symmetry rarely exists between languages. All natural languages, as they stand, differ in their phonological, morphological and syntactic features. This is a linguistic fact that no one can deny. Translation, as a linguistic activity for facilitating communication between different language communities, must take that as its starting point, but not as its goal. Its primary task is to convey the various types of meaning which are independent of the conventionalized arbitrary features of human languages. And exact translation, as a meaningful concept, must be understood in that context, and as a linguistic activity, must

proceed under those constraints. To aim at morphological and syntactic symmetries is to set translation a task that goes against its very nature. If I play you Beethoven's Moonlight Sonata on a guitar, you can expect to hear the music but not the piano. To say that the Moonlight Sonata can never be exactly translated into a piece of guitar music is to say that a guitar is not a piano: true but trivial!

Thus people who argue against the possibility of exact translation in fact base their argument on an extremely unrealistic assumption about exact translation: An exact translation of a sentence S in Language L is a sentence S' in Language L' if and only if S' is identical in all respects with S and L' is identical in all respects with L (except perhaps for their phonological features). Absurd as it may seem, this is also what they all want to prove. Their argument is in the final analysis circular.

3. Translating the Common Law

3.1 The nature of law

Once we dispel the myth, we shall be able to see the whole problem aright. As has been shown, sign and meaning are not inseparable from one another. Thus it would be a travesty of truth to claim that the Common Law cannot be dissociated from the English language. Unlike the part of literature, e.g., poetry, which often exploits the special phonological, morphological and syntactic features of a language to achieve aesthetic effects and is therefore language-bound to some extent, law as a social institution is not dependent on language in that sense. Law is a set of rules which prescribe and regulate human behaviour. Legal systems differ only in the content but not in the nature of such rules. Such rules need not be written, as in the case of customary law. They are embodied in social norms which people observe knowingly or unknowingly. As for those which are written, as in the case of enacted law, language is used to confer powers and to impose obligations (Coode 1852, Hart 1961). Thus law is primarily concerned with human behaviour as the latter "is the content of legal obligations and legal rights" (Kelsen 1970, 173). One important property of human behaviour is that it is publicly observable. Accordingly, all legal systems can be understood in the light of human behaviour observable in identifiable circumstances and conditions. The Common Law is no exception. Human behaviour, as well as the circumstances and conditions in which it is observed, can be described with sufficient precision in any language. The same of course holds true of the human behaviour prescribed and regulated by the Common Law.

3.2 Legal meaning

To translate the Common Law into Chinese and make the translation law amounts to rewriting the Common Law in Chinese in such a way that the Chinese version can prescribe the same behaviour as the English version not only by virtue of its legal authority, but also by virtue of its legal meaning. The question which naturally arises here is: How does the Chinese version acquire the same legal meaning as the English version?

To answer this question, we must first answer a more fundamental one: How does the English version acquire its meaning in the first place? The answer cannot be more obvious. The English version acquires its meaning from the Common Law. That is to say, what makes it a text of the Common Law is the Common Law itself. The text prescribes a particular behaviour which forms part of the totality of behaviour prescribed by the Common Law. Inasmuch as legal meaning is concerned, the Common Law is the semantic reference scheme of all its texts. A semantic reference scheme is what a text refers to by way of acquiring its meaning. A simple example would be the language of chess, which has as its semantic reference scheme the totality of all possible movements on the chessboard governed by the rules of chess. The language of chemistry, a far more complex language, has as its semantic reference scheme the totality of the behaviour of substances under different conditions investigated by chemistry. Likewise, the totality of behaviour precribed by the Common Law is the semantic reference scheme which gives legal meaning to all its texts, whatever language they are written in.

As has been noted, although no two texts in different languages are identical in all aspects of meaning, semantic equivalence, not in the wishy-washy sense of which many have complained (Newmark 1981, X, Snell-Hornby 1988, 21), but in a significant sense, can still exist between them if they are compared with reference to the same aspect of meaning. Since the whole purpose of rewriting the Common Law in Chinese is to prescribe the same behaviour as the English version, semantic equivalence between them should be defined in terms of the sameness in legal meaning, which is evidently the most relevant aspect of meaning they should have in common. "The purpose," as I.A. Richards puts it, "decides which respects are relevant" (1953). All discussion about semantic equivalence will become futile if we do not focus on the aspect or aspects of meaning relevant to a particular purpose. So we can now define semantic equivalence between two legal sentences in the following way:

(1) Semantic equivalence	= sameness in meaning with reference to the relevant aspect(s)
(2) A sentence S in Language L is semantically equivalent to a sentence S' in Language L	= S and S' have the same meaning with reference to the relevant aspect(s) and S and S' have the same semantic reference scheme
(3) The legal meaning of a sentence S	= The prescriptive value of S
(4) A sentence C of the Chinese version of the Common Law has the same legal meaning as a sentence E of the English version of the Common Law	= C and E have the same prescriptive value, i.e., they prescribe the same behaviour under the same circumstances and conditions

3.3 Bridging semantic gaps

The non-existence of equivalent Common Law terms in the Chinese legal vocabulary has led many to argue that the Common Law is not exactly translatable into Chinese. There may be close equivalents, they maintain, but they do not mean exactly the same as their English counterparts. We have seen that their premises are true, but their argument is invalid. Of course Chinese does not have equivalents for terms such as "hereditaments", "fee tail", "fee simple", "vacant possession", "legal charge", etc. And however close, a Chinese term, as it stands, does not have Common Law meaning, because its meaning is not derived from the Common Law. And the whole Chinese language, as it stands, is incapable of conferring Common Law meaning on its legal vocabulary. A Chinese legal vocabulary acquires Common Law meaning only when it takes the Common Law as its semantic reference scheme. This requires a drastic shift from the conceptual scheme of Chinese legal thought to that of English. To put it in another way, a Chinese legal vocabulary cannot have Common Law meaning unless and until it is defined, understood and interpreted not in the light of Chinese legal thought, but in the light of English legal thought. Such a vocabulary will probably consist of existing terms as well as new ones. Whether existing or created, all such terms must be **given** Common Law meanings before they can used as Common Law terms. **A Chinese Common Law vocabulary is not to be found-- it is to be created.**

The important thing to note here, however, is that the created vocabulary will not be completely unintelligible to the Chinese user. For as in the case of the Eskimo word, a new English word for snow that has been partially melted and then refrozen may be Greek to an Englishman, but he can understand it perfectly well if he takes a glance at the defining clause, which consists of words he already knows. The new Chinese term for "vacant possession", whatever that will be, will also become intelligible to the Chinese user in the same manner. That this is possible is due to the fact, a hard fact as well, that although no two languages are identical, no two languages are completely different either. Two languages always overlap each other, having a common semantic field within which the two language communities communicate. The more the two communities come into contact, the larger their common semantic field becomes. It is the existence of common semantic fields between languages that makes communication between different language communities possible. A language expresses new meanings by re-structuring old ones; it can never create new meanings out of a semantic vacuum. This is how semantic gaps are bridged. And this is how a language assimilates new ideas. The creation of a Chinese Common Law vocabulary for the rewriting of the Common Law in Chinese will signify a large-scale assimilation of the entire English legal tradition into Chinese culture.

3.4 Implications

Now it becomes evident that translating the Common Law into Chinese is no ordinary translating work. Ordinary translation operates in the target language as it stands, while translating the Common Law necessitates the re-structuring of the semantic fields of all the Chinese concepts involved so as to give them Common Law meanings. Failure to see this difference has led many to expect that once an ordinance is translated into Chinese, the translation is fully comprehensible even to the layman. This is of course false expectation. If the English version of an ordinance is not fully comprehensible to the English layman, how can one expect that the Chinese version will be fully comprehensible to the Chinese layman? The removal of the language barrier does not entail full understanding of a subject matter. To understand the Chinese version requires no less legal knowledge than to understand the English version.

There is another misconception, a much more serious one, which arises from the failure to see the double function of the English language in the bilingual laws project. People tend to think that because the Chinese version has the same legal status as the English version, it can be understood independently of the English version and should not be treated merely as a translation. Indeed, as authentic versions of the law, both should in theory be treated equally. But the English version is not just one of the two authentic versions of the law. It has another important role to play. As part of the Common Law, it must serve both as part of the meaning-conferring corpus and as the meaning-criterion for the Chinese version until legal Chinese has fully developed into an autonomous language of the Common Law. Such a role can only be played by English. For the Common Law is not an abstract entity apprehensible by some kind of intuition. It is embodied in the whole corpus of decided cases and statutes written in English. Accordingly, there is no other way to gain access to the Common Law except through English. The Chinese version can only acquire its Common Law meaning through English, and its accuracy can only be checked against the English version. There needs to be a "feeding and checking period" for Common Law Chinese which is still at its early infancy. Recall that the assimilation of Buddhism into Chinese culture took over a thousand years until it fully developed into Chinese Buddhism. The assimilation of the Common Law tradition, if it is to be carried out with sincerity, will certainly take considerable time. Thus it would be erroneous to think that having a Chinese Common Law will downgrade the importance of English. It would be equally erroneous to think that as soon as the whole set of Hong Kong Ordinances are available in Chinese, English can be discarded for good.

Whether bilingual legislation will succeed depends ultimately upon the willingness, sincerity and determination of the legal profession to put the Chinese version of the law to use. For there can never be Common Law Chinese unless it is put to use. To put it to use is to put it to test, and to put it to test is to give it life. This requires that more Chinese be used not only in the courts but also in the daily legal affairs of the community. Above all, this requires that judges be equally proficient in English and Chinese. For however well the Chinese version of the law is written, discrepancies

between the two versions can never be avoided. Since it is the duty of the judge to resolve conflicts in interpretation, he must be able to handle both versions of the law equally well. As we all know, the judge in the Common Law system holds a central position because he has the power to make new law through precedent. His position is even more crucial in a bilingual-laws system because he has the final word for deciding semantic equivalence. In this connection, an additional criterion for determining semantic equivalence under bilingual legislation must be noted:

> (5) A sentence C in the Chinese version of the law is semantically equivalent to a sentence E in the English version if and only if whatever interpretation given to E by the court is given to C.

It goes without saying that bilingual legislation simply cannot operate without bilingual lawyers and bilingual judges. Consequently, training in Chinese for legal professionals is a necessary component of the whole bilingual laws project.

4. Concluding remarks

English did not become the full-fledged language of the Common Law until the third English-for-lawyers law took effect on 25 March 1733, several centuries after the English began their fight for the right to use their mother tongue in courts of law (Mellinkoff 1963, 95 - 135). The problems with which we are now confronted are not concerned with language rights, as the launch of the bilingual laws project is a clear indication that the right to have a Chinese version of the law has been recognized. Some of those problems are theoretical ones relating to language and law, while some are rooted in people's resistance to change. As academics, we have done our part to show that translating the Common Law into Chinese is both theoretically and practically viable. The task is in fact also an extremely significant one. It will allow Chinese culture to bring in a legal tradition which respects human dignity, because once it is in the language, it will become part of Chinese culture. As to the emotive problems, they can only be solved by a change of attitude on the part of those who do not fully appreciate the significance of the task.

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法律的可譯性

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由於政治形勢的轉變，香港施行雙語立法，所有新法例須以中英文草擬及制定，而現行法例的英文文本，亦須翻譯爲具有同等眞確性的中文文本。雙語立法要求中英文文本須具有同一的法律意義，但很多人認爲這點在理論上是不可能的，主要的論據有三:

(1) 語言的形式與意義是不可分的，形式改變，意義即改變。

(2) 語言本質上是不精確的，不容許精確的翻譯。

(3) 不同語言間存有語法上與詞彙上的差異，不可能有一一對應的關係，因此亦不可能有意義上的對等。

倘若以上的論據成立，雙語立法便是不可能的，這將動搖香港現行法律制度的基礎。本文的目的，是要剖析以上各論據是否成立，進而展示「法律意義」這概念的確切意義，以及法律翻譯在雙語立法制度下的特質，從而建立雙語立法的理論基礎。

論據(1)是基於一個錯誤的假定: 意義的同一性只有在 A=A 這個條件下才可能，即不同的語言間邏輯上是不可能存有意義的同一性。換言之，意義的同一性是被界定爲不可能。此外，論據(1)把不同種類的意義混爲一談，忽略了不同的符號可具有相同的指涉意義這個顯明的語言事實。論據(2)錯誤地認爲: 由於語言是一個有限的符號系統，卻要表示無限多的意義，因此它本質上是不精確的，所以我們便不能精確地使用語言。這論據其實是混淆了「精確」一詞兩個不同的意義。論據(3)錯誤地假定: 意義上的對等，只有在兩個語言的語法與詞彙有一一對應的關係的情況下才可能。

法律基本上是軌約人類行爲的規範，法律條文的意義也就是法律語句的規範功能。法律行爲雖有其社會文化的特性，但畢竟是可觀察的。某一法律制度下的行爲模式，理論上是可以透過不同的語言達致，此中最重要的，是不同的語言必須以同一個行爲模式作意義的參考系統。香港的法律制度，既然是建基於普通法，則中文文本必須以普通法的行爲模式爲意義參考系統，才可以取得與英文文本同一的法律意義。要達致這一點，則中文的概念系統須作出相應的調整。

Cantonese-speaking Children's Understanding of Anaphora*

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0. `Anaphora' can be defined generally as the referential relation between an anaphor and an antecedent. This study investigates the development of Cantonese-speaking school-age children (Grade 2, Grade 4 and Grade 6) in resolving anaphora through listening and reading. Specifically it aims to find out the developmental differences in children's use of structural and functional factors in resolving 3rd person singular pronouns and covert NPs in the subject position of sentences. Children's anaphoric resolution was compared with that of the adults'.

This study examines the following:
1). How do children interpret intra-sentential (`structural') anaphora?
2). What principles would children use in resolving cross-sentential (`functional') anaphora?
3). Would there be differences in interpreting covert subject NPs and subject pronouns?
4). Would there be differences of anaphoric resolution in listening and reading?
5). Would children pay attention to orthographic information in the pronoun?

1. Development of anaphora

Researchers on anaphora aim to explain anaphora acquisition in terms of the constraints on children's formulation of hypotheses on language structure, the principles children are in control of, and the information they use in the different stages of anaphoric development before an adult grammar is attained.

In adult language, it is well known that different aspects of the language: syntactic, semantic, discoursal, pragmatic, and general cognitive factors, all come into play in the use and resolution of anaphora (see, for example, Li and Thompson, 1979 and Strage, 1984). As for children, they are sensitive to different sources of linguistic information in the development of anaphora. Marslen-Wilson and Tyler (1980) summarize the sources of information in anaphoric `mapping' processes as including: (i) the lexical properties of the pronoun; (ii) the sentential configurational properties, (iii) the relationship of the pronoun to discourse, e.g. topic, focus, foregrounding; and (iv) pragmatic inference based on what is said elsewhere in the utterance.

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As for the development of anaphora, a three-phase development of pronoun is offered: Karmiloff-Smith (1980) studied English-speaking and French-speaking children between the age of four to nine. She reported that children's earliest use of pronouns was deictic, i.e., pronouns appropriate for extralinguistic referents were used. Older children, aged around six, began to use personal pronouns anaphorically in sentential initial positions in narratives to refer to thematic subjects. This reflects their sensitivity to intra-linguistic cohesive devices. She concludes that the psychological processes underlying pronominalization and non-pronominalization in children's connected discourse is a function of the thematic organization that the child has created. From about age six onwards children's control of pronouns in language production is characterized by the thematic subject constraint, that is, pronouns are used to maintain the most prominent entity, the protagonist, in the discourse representation, and do not function deictically. These two phases of the development of pronouns -- the first phase being the deictic use of pronouns and the second phase being the non-deictic, thematic subject signalling, use of pronouns until about five years of age -- were in general supported by the studies of Tyler (1984).

Tyler (1984), working with Dutch-speaking children aged five, seven and ten, showed that the thematic subject constraint is, however, not as dominant for the young children (aged five and seven in this study) as one might have expected it to be, based on earlier research such as Karmiloff-Smith's (1980). These children began to show sensitivity to the lexical properties of pronouns, for example, the gender of pronouns, in the tasks of mapping between utterance and discourse. Moreover, she found that the pragmatic implications of the verb were dominant. When there was conflict of constraints in the discourse, the pronoun and the verb, children either responded with the protagonist which was appropriate for the verb, or they resolved the conflict by introducing a new entity. According to Tyler, the third phase of anaphoric development, starting from about five years of age, is characterized by the interaction of different sources of processing information, including the structure of the discourse, lexical properties of the pronoun and pragmatic inferences.

Despite the differences in theoretical perspectives and subsequent diverse research paradigms which make it difficult to compare results, some points have generally been agreed on by researchers with regard to the development of anaphora. Definite noun phrases are notably used anaphorically before pronouns. The early use of pronouns is deictic. This suggests that children's initial use of reference is extralinguistic in nature, and only gradually do they acquire true anaphoric referencing ability.

2. Structural constraints on anaphoric acquisition

When structural factors in anaphoric resolution are concerned, there is, however, both incompatible and parallel findings reported in different studies. Children's sensitivity to syntactic, structural linguistic information is taken as a reflection of the principles and constraints in the acquisition of anaphora. Indeed the

relevance of the study of anaphora lies in the challenge it poses to the linguistic theory of universal grammar (UG), in terms of the constraints on the possible representations that human languages can assume (Chomsky 1981). UG claims to constrain children's hypothesis formation on language structure, eliminating many logical possibilities, thereby, accounting for language acquisition. Language acquisition theory claims that in resolving structural anaphora, children will consult their grammar, i.e. they will be restricted by their hypotheses on language structure. In other words, children will interpret language data in terms of an abstract representation of the sentence and their early hypotheses about language will be `structure-dependent'.

The acquisition of anaphora has been studied in different languages but without definite conclusions. For example, a constraint on anaphora observed in early child language is known as the directionality constraint. The direction of anaphora will be constrained leftward in a left branching language and rightward in a right branching language. That means, for example, in anaphoric acquisition of English, which is a right branching language, the child's hypothesis is that the anaphor should follow, not precede the antecedent. In their study with English-speaking children, Lust and her colleagues (1980, 1981 and 1983) reported that children between the ages of four and seven often avoided backward anaphora and opted for exophoric referencing in cases where a pronoun preceded any intra-sentential NPs. Moreover, young children did not fully appreciate that different grammatical restrictions pertain to the interpretation of null and pronominal anaphors. Lust (1983) suggested that the aversion of backward anaphora stems from an early directional constraint on all anaphora.

Data from Korean- and Japanese- speaking children, aged four to nine and three to eleven respectively, did not support directionality preferences in children's anaphoric resolution (O'Grady et al., 1986). These researchers concluded that directionality preference for anaphora is the same for all languages regardless of the branching direction. Linearity was proposed to be a critical factor and backward patterns of co-reference were predicted to be more marked in all languages.

Goodluck (1981) reported that five-year-old children made fewer than ten percent exophoric interpretations of null anaphors in sentences containing pre-posed missing-subject complements. She proposed that children were making a distinction between null and pronominal anaphora. Goodluck's hypothesis and Lust's suggestion are incompatible with each other. To answer the question of whether the same processes are involved in resolving null and pronominal anaphora, one needs to examine the response patterns of the same children to both kinds of anaphors.

Concerning acquisition of anaphoric types across languages, Wexler and Chien (1985) studied English-speaking children's acquisition of reflexives and pronouns (aged two-and-a-half to seven) and found that children by age five-and-a-half showed knowledge of reflexives but not pronouns. Parallel findings were reported with Chinese (Mandarin) speaking children (Chien and Wexler, 1987).

3. Structural anaphora and functional anaphora

3.1 Structural anaphora is here defined as anaphoric relations which are structurally determined vis-a-vis the Principles of the Binding Theory (cf. Chomsky 1981):

A: an anaphor must be locally bound;
B: a pronoun must be locally free;
C: an *r* expression must be free.

The principles are very general and are intended to constrain how NP types refer to one another within and across clauses. `Anaphors' include reflexives; `pronouns' include lexical pronouns; *r* expressions (*r* for `referential') are names or variables in the empty category. Empty categories include: NP- trace, PRO (pronominal anaphor), and variable.

The general properties of the structurally determined anaphoras are that syntactic constraints such as the structural notions of `c-command' and `local domain' determine the resolution of anaphoric relations within a sentence. `C-command' (`c' for `constituent') means that in a phrase-marker, node x c-commands node y if and only if the first node that dominates x also dominates y. A `domain' of a node x consists of all and only the nodes c-commanded by x (Reinhart 1983). In general, the constraint on pronouns is that pronouns may not c-command their antecedents, and the antecedent cannot be in the same local domain as the pronoun anaphoric to it. This can be translated as: a pronoun cannot have a clausemate antecedent which is higher up in the structural tree.

3.2 This study examines how Cantonese-speaking children interpret sentences containing lexical and null pronouns. The interpretation of these elements is structurally determined, ie. by Principle B of the Binding Theory.

This study also includes under the category of structural anaphora those pronouns whose interpretations may not be readily explained by invoking the Binding principles, but for which structure is nonetheless consulted in anaphoric resolution. In these cases, the antecedent and the pronoun occur in the same clause, a clause being taken to require the minimal element of `predicate'. Arguments are assumed based on the lexical information contained in the predicates. For example, a null NP is assumed to be present whenever an argument is assigned by the verb but the corresponding argument position does not contain a lexical item (cf. `Projection Principle', Chomsky 1982). A null subject is assumed if the argument position is the subject position. This is based on the `Extended Projection Principle' (Chomsky 1982) that requires a clause to have a subject. A test item in this study like (1) below illustrates this point:

(1) Zhiming$_i$ you ge linju$_j$ shi Shanghairen$_j$
(Cantonese: Jiming$_i$ yau go leungeui$_j$ hai Seunghoiyan$_j$)
(English: Zhiming$_i$ has a neighbour$_j$ is Shanghainese$_j$)

In the original analysis (Huang 1987) no empty NP is posited to be the subject argument of the predicate *hai*. But if the following question is asked: `Who is Shangainese?' the answer is NP$_j$. NP$_j$ *ge linju* is the subject argument of the VP *shi Shanghairen*. The anaphoric resolution has to consult the structure and a general syntactic principle has to be invoked so that the process is possible. And there is no pause after NP$_j$. In this study items like this are considered to involve structural anaphora.

The cases of functional anaphora covered in this study consist of sentences in which the antecedent and the pronoun occur in independent clauses.

In (2) below, two separate sentences are given, connected by the temporal conjunction *bian* (*then*). In the first sentence are two possible antecedents, identified by their respective subscripts. In the second sentence are two null subject NPs, indicated by 0s, one in the matrix clause, the other in the embedded clause.

(2) Bide$_i$ jiandao Guoqiang$_j$, 0$_i$ bian wen laoshi 0$_i$ keyi bu keyi dao coachang shang qu
(Cantonese: Beidak$_i$ gin dou Kwokkeung$_j$, 0$_i$ jau men sin saang 0$_i$ ho m ho yi heui chou cheung)
(English: Bide$_i$ saw Guoqiang$_j$, 0$_i$ then ask the teacher whether 0$_i$ could go to the playground)

The interpretation that the first 0$_i$ and NP$_i$ co-refer is non-structural in nature in the sense that the configurations of the two sentences are independent. The temporal conjunction *bian* (the counterpart in Cantonese speech is *jau*) conjoins the two sentences. In speech, Mandarin or Cantonese, the temporal connective *bian* or *jau* does not receive stress.

The resolution of this anaphoric relation can be based on the observation that, in the Chinese language, a most common syntactic position of a null pronoun is the subject position of the second coordinately-conjoined clause. This is because the `predictability' of the reference to the subject is high in conjoined clauses and null pronouns are therefore commonly found in that particular syntactic position (Chen 1984).

This study hypothesises that children in resolving functional anaphora would have to make judgement on whether the subject reference is continued or switched between clauses.

To continue with (2): In the second sentence of (2), the second instance of 0 in the embedded clause is coreferential with the first 0 in the matrix clause. This dependence is subject to the syntactic constraints of `c-command' and `local domain'. The second 0 is co-referential with the first 0, which, by our earlier considerations, is considered to be co-referential with NP_i, *Bide*.

(3) below is a sample test item regarded as an instance of structural anaphora. It is a complex sentence consisting a matrix clause and two embedded clauses:

(3) Bide$_i$ jiandao Guoqiang$_j$ PRO$_j$ wen laoshi 0$_j$ keyi bu keyi dao coachang shang qu
(Cantonese: Beidak$_i$ gin dou Kwokkeung$_j$ PRO$_j$ men sin saang 0$_j$ ho m ho yi heui chou cheung)
(English: Bide$_i$ saw Guoqiang$_j$ PRO$_j$ ask the teacher whether 0$_j$ could go to the playground)

PRO, a covert pronoun, is presupposed to be in the subject position of the *wen*-cluase. Its interpretation is controlled by the object of the matrix clause and therefore shares the same subscript. Also, PRO c-commands the subject of the *keyi-bu-keyi*-clause, a null NP 0, and PRO can be a potential antecedent.

(4) below is the same as (3) except that a lexicalized pronoun *ta* in (4) now occupies the syntactic position of 0$_j$ in (3). *ta* and PRO can be co-referential.

(4) Bide$_i$ jiandao Guoqiang$_j$ PRO$_j$ wen laoshi ta$_j$ keyi bu keyi dao coachang shang qu

(5) and (6) below are to be looked at together:

(5) Bide$_i$ huale yige chaoren$_j$ shifen haokan
(Cantonese: Beidak$_i$ waak jo yat go chiu yan$_j$ fei seung hou tai.)
(English: Bide$_i$ drew a superman$_j$ very good looking)

It is noted that (5) and (1) are of the same construction: (NP_i) - VP - NP_j - (XP) (Huang 1987). The (XP) constituent is an AP, namely, an adjective phrase, *shifen haokan* (*very good looking*) which predicates on NP_j *chaoren* (*superman*). NP_j is the answer to the question: `Who is very good looking?' NP_j is the subject of the AP predicate.

(6) Bide$_i$ huale yige chaoren$_j$ 0$_i$ shifen manyi
(Cantonese: Beidak$_i$ waak jo yat go chiu yan$_j$ 0$_i$ fei seung mun yi)
(English: Bide$_i$ drew a superman$_j$ 0$_i$ very satisfied)

(6) has the same surface structure as (5): NP_i - VP - NP_j - AP, but in fact, unlike (5), the AP *shifen manyi* (*very satisfied*) does not predicate on NP_j. Rather, it specifies for a subject argument to have the thematic role of `experiencer', an entity that can experience some psychological state of being satisfied. NP_i is a person and can be an experiencer; NP_j cannot. So in this study, (6) is regarded as different from (5): the choice of the antecedent is determined by selection restrictions, which are semantic/pragmatic in nature. Hence the anaphora in (6) is non-structural but `functional', for the purpose of this study.

4. Anaphoric resolution of null versus lexical pronoun subjects

It is in the context of functional anaphora that we are going to discuss the resolution of null versus lexical pronouns.

Cognitive inferential ability is brought to bear on resolving anaphora because of the characteristics of null and lexical pronouns in discourse in Chinese. One such characteristic is the frequent use of null elements in the subject position of the second coordinately-conjoined clause. This has been attributed to the high predictability of reference to the subject (Chen, 1984).

An example is (2) above. The point of making a distinction between null and lexical pronouns (hereafter referred to simply as pronouns) is that there are instances in which the latter are preferred to the former. Li and Thompson (1979) maintain that 'zero anaphora' is the unmarked case in Chinese and suggest (1981) a `highlighting' function of pronouns to explain instances in which the referent can be understood but still pronouns are used. Pronouns are used in clauses when unexpected information is introduced, vis-a-vis the information conveyed in the preceding clauses. In Chen's analysis (1986), the pronoun functions to signify a maintained-reference subject or a switched-reference subject vis-a-vis the notions of pronominal anaphora (PA) for `maintained-reference subjects' and `switched-reference subjects'.

(7) and (8) below each consist of two independent clauses. The two items contain ambiguous anaphora in that the null subject in the second clause of (7) and the pronoun subject in the second clause of (8) can refer to NP_i or NP_j in the first clause.

(7) Tiyuke shangwan le.
Xiaomei$_i$ wangzhe Xiaohung$_j$, 0$_{ij}$ hai meiyou huan hao yifu
(Cantonese: Tai yuk tong seung yun lak. Siumei$_i$ mong jyu Siuhung$_j$, 0$_{ij}$ jung mei wun hou yi fuk)
(English: Gymnastics class was over. Xiaomei$_i$ looked at Xiaohung$_j$, 0$_{ij}$ had not changed clothes yet)

Pragmatically NP$_i$ and NP$_j$ can be the antecedent. But `predictability' further favours NP$_i$.

(8) Xiaohua$_i$ dale Xiaoqiang$_j$ liangxia, ta$_{ji}$ jimangde zoukai le
(Cantonese: Siuwa$_i$ da jo Siukeung$_j$ leung ga, keui$_{ji}$ jau gap mong gam jau hoi le)
(English: Xiaohua$_i$ hit Xiaoqiang$_j$ twice. He$_{ji}$ immediately went away.)

The reference is ambiguous in that the pronoun can refer to NP$_j$ or NP$_i$. The co-reference of the pronoun and NP$_i$ can be explained in terms of the notion `maintained-reference subject'. The co-reference of the pronoun and NP$_j$ can be explained in terms of the notion of `switched-reference subject' (Chen 1986). The use of subject pronouns therefore reflects the language user's cognitive choice of maintaining or switching the subject reference.

5. Understanding anaphora in listening and reading

Listening and reading are two closely related language skills. Listening comprehension measures language acquisition (Durrell and Hayes, 1969). It is regarded by some educational psychologists as the most satisfactory measure of reading potential (Harris and Sipay, 1980). The rationale is that the same linguistic knowledge measured in listening comprehension appears later in reading. The correlation between listening and reading starts low at Grade 1 (r = .35) and increases steadily at Grades 5 and 6 (r = .60) and remains at that level through secondary school and college (Sticht et al., 1974).

But spoken language and written language differ in many respects. For example, written language has more embedded structures than does spoken language (Chafe, 1982). It is also a well-known fact that syntactic and semantic information is conveyed to the listener through chunking of phrases and the prosodic features given by the speaker in natural speech. The conventions in written language such as punctuation marks are pale by comparison as aides to comprehension.

Children learn to use language contextually, that is, meaning is constructed and interpreted using linguistic, social, situational and extra-linguistic means. Anaphora is

abundantly found in language. In language development, exophoric referencing and deictic use of pronouns are commonly found to be employed by young children (see, for example, Karmiloff-Smith 1980; Strage, 1984). But in schooling, the kind of written language typically found in textbooks and some types of spoken language found in the classroom such as lectures are decontextualized language. Decontextualized language is considered to be coherent and comprehension depends chiefly on the information given in the text. In terms of anaphora, which is a `cohesive tie' (Halliday and Hasan, 1976), the antecedents are to be found in the text itself. In the course of school education, children are learning to understand and use decontextualized language and teachers are concerned about teaching cohesion comprehension (for example, Irwin, 1986). So in learning decontextualized language, children will have to learn to be sensitive to the structural and semantic linguistic information given in the text.

This study examines how school-age children acquiring Chinese (Cantonese) compare with adults in resolving structure- restricted and non-structure-restricted null vs pronoun subjects in different types of sentences through listening and reading.

6. Orthographic information in pronouns

There are devices in languages that can disambiguate a pronoun, for example, animate/inanimate distinctions (*he/she/it*), natural gender distinctions (*he/she*), orthographic natural gender distinctions (the character representing '*he*' 他 has a '*man*' radical and the character representing '*she*' 她 has a '*female*' radical in Chinese script), grammatical gender for inanimates (*le/la* in French), etc. But Karmiloff-Smith (1980) argues that children do not necessarily make use of these devices. She argues that the early use of pronouns is not necessarily anaphoric, but is governed by thematic constraints as discussed earlier on.

The Chinese language exhibits orthographic natural gender distinctions in pronouns. In writing, the character representing `*he*' has a `*man*' radical 人 and the character representing `*she*' has a `*female*' radical 女 . But in speaking, `*he*' and `*she*' are pronounced as `*ta*' in Mandarin and as `*keui*' in Cantonese.

This study used the following items to test whether children are sensitive to orthographic cues in resolving pronouns.

(9) Didi$_i$ kanjian Zhenni$_j$ shi, *ta*$_i$ zhengzai chi tongxi
(Cantonese: Daidai$_i$ tai gin Jannei$_j$ ge si hau, *keui*$_i$ jing joi sik ye)
(English: At the time brother$_i$ saw Jenny$_j$, *he*$_i$ was eating)

(10) Zhenni$_i$ kanjian didi$_j$ shi, *ta*$_j$ zhengzai wenxi gongke
(Cantonese: Jannei$_i$ tai gin daidai$_j$ ge si hau, *keui*$_j$ jing joi wan jaap gung fo)
(English: At the time Jenny$_i$ saw brother$_j$, *he*$_j$ was studying)

Items in (9) and (10) are complex sentences of the same structure. An adverbial clause is followed by the main clause. NP_i and NP_j in the first clause are names of opposite sexes. The pronominal anaphor *ta* is in the second clause.

The pronouns in (9) and (10) are in theory ambiguous when heard. In writing, the radical of the character *ta* differentiates gender. In (9), the written *ta* denotes the same gender as NP_i. In (10), the written *ta* denotes the same gender as NP_j.

The verb in the subordinate clause is *kanjian (have seen)*. If NP_j is chosen to be the antecedent of the subject pronoun in the following main clause, it indicates an interpretation that NP_j is the actor in the scene of what NP_i was seeing. In (9), the orthographic information of the pronoun is to introduce a bias against this interpretation in reading.

7. The Study

7.1 Subjects

The subjects in this study were school children and adults in Hong Kong. Their first language was Cantonese, which is the language spoken by the great majority of the Chinese people in Hong Kong. In many primary schools including the one that the children subjects were studying in, Cantonese is used as the medium of instruction. But for a Chinese to learn to read and write means for him to learn what is known as `Modern Standard Chinese'. Modern Standard Chinese is the typical written form of the Chinese language. The syntax and vocabulary are largely based on Mandarin Chinese. Chinese language speakers may be speaking their own regional versions of Chinese, sometimes known as `dialects'. But if they are literate, they are reading and writing in only one form of Chinese -- Modern Standard Chinese. In the Hong Kong schools, Cantonese phonology is used in reading aloud the printed Chinese words and at the same time children learn the syntax of Modern Standard Chinese in order to learn to be literate in Chinese.

Two hundred and fifty-six subjects were divided into two groups: a `zero group' and a `pronoun group'. The 128 subjects in each group were composed of 96 school children and 32 adults.

The school children were of three grade levels: Grade 2, Grade 4 and Grade 6. All were from a primary school in a working class community. The average age of the Grade 2 children in this study was eight, that of Grade 4 was ten, and that of Grade 6 was twelve.

In each group there were a total of 96 children. Sixteen boys and 16 girls had been randomly chosen from each of the three grade levels, resulting in 32 children taken from each grade level.

The 32 adults in each group consisted of 16 men and 16 women. They were in their mid-twenties. All adults had completed secondary education; the majority of them had one to three years of post-secondary education. About half of them had an average of one to three years of work experience.

7.2 Test Items

The test items used in the present study are typical of those found in the textbooks in Hong Kong. The syntax of the test sentences used in this study is virtually the same in both Cantonese and Modern Standard Chinese in that the order of the structural constituents in the test sentences is identical in Standard Chinese and in Cantonese. A full list of the test items appears in the Appendix of this report.

In each test item, the antecedent occurs in the first clause and the null or pronoun subject NP occurs as the subject of the second clause. A question is asked about the anaphora in each sentence.

Each individual subject in the listening or reading sub- group in each of the four grade/age levels would answer 30 test items if he was in the zero group and 27 test items if he was in the pronoun group. The 30 zero items and the 27 pronoun items are classified into structural anaphora and functional anaphora. There are six pronoun items with orthographic cues.

7.3 Procedure and Materials

All subjects were tested individually. The 256 subjects were randomly divided into two groups: the zero group and the pronoun group. The 128 subjects in the zero/pronoun group were randomly divided into two sub-groups: half the boys and half the girls in each grade level (half of the male adults and half of the female adults) were asked to read out the test items (the reading-subgroup) and the other half were asked to listen to the test items played on a tape recorder (the listening-subgroup). So with each grade/age level, there were 16 subjects each in the zero-listening, zero-reading, pronoun-listening, and pronoun-reading groups.

At the beginning of the test, about fifteen words that appeared in the test items were printed on cards and presented to each of the Grade 2 children to read in order to check if they already knew them. The sample words presented no reading difficulty to them.

With the reading-subgroup, the subject read aloud a test item printed vertically in Chinese characters on a 4"x6" card. After the subject finished reading the card, the experimenter asked a question. For example, after reading this item: '*Mimi saw Jenny ask teacher whether could go to playground*', the subject would answer the question posed by the experimenter: '*Who wanted to go to playground?*'

The subject's answer was taken down by the experimenter on a coded record sheet. The subject then continued with the following item. The subject saw only the card with the current test item. The card was not withdrawn from the subject when he was answering the question.

The procedure was similar with the listening-subgroup except that the subjects were asked to listen to each item played on a tape-recorder. The tape was a female voice reading out the test items in Cantonese with moderately slow speed and natural sentential intonation. Care was taken to read out the pronouns in even stress in the tape. After listening to each item, the experimenter stopped the machine and asked the subject a question. If a subject wanted an item repeated, the experimenter read it again for him. Requests for repeats were not frequent.

The task took an average of fifteen to twenty minutes to complete. Two to three short breaks were included in each administration with the younger subjects.

The test sentences were randomly arranged into two ordered sets. The two sets were the same for reading and listening. Half of the total number of subjects, with equal number of boys and girls of each grade in each listening/reading subgroup, were given one set; the other half were given the other set. The assignment of subjects to sets was random.

Two experimenters tested the subjects in the zero group. The same two experimenters and a third experimenter tested the subjects in the pronoun group. All the experimenters were female and natives of Hong Kong with Cantonese as their first language.

7.4 Analytical Design

To code the subjects' choice of noun phrases as answers to the questions after listening to or reading a test item, `1' was used to signify that $NP_i$ was given as the answer and `0' was used to signify that NP_j was given as the answer. In all test items, NP_i is always the subject of the clause; `1' signifies the earlier coreferent. $NP_j$ is always the object of the clause; `0' signifies the later coreferent.

There are three items in each item group of A to Q, with the exception of F and O, each having six items. The mean score of the items in each item-group was calculated for each grade/age level (sum of the individual subjects' mean scores in each item-group divided by the total number of subjects in each grade levels, i.e. 16 subjects). Four such grade/age-level mean scores were thus obtained and were compared.

If the mean score of an item group of a particular grade/age level is, say, .98, that means the mean proportion of NP_i having been picked as the coreferent by the subjects in that particular grade/age level is 98%. If the mean score is, say, .17, that means the mean proportion of NP_i having been picked as the coreferent is 17%; or in other words, the proportion of NP_j having been picked as the coeferent is 83%. A mean score close to .50 means that almost equal proportions of NP_i and NP_j were picked.

With each item-group, the means of the grade/age levels were compared. This was done by plotting the means of listening and reading on a graph with the vertical axis being the `proportion of $NP_i$' and the horizontal axis being the `grade/age level'. One-way ANOVAs with the dependent variable being the mean proportion of NP_i and the independent variable being the grade/age level and a significance level of .05 were performed in cases where the differences between the means were of questionable significance. The analysis was mainly descriptive. This is the case because the number of items in each group was not large enough to warrant reliability of a 2x2x2x4 mixed repeated ANOVA analysis with one between-group factor of `zero vs pronoun' and three within-group factors of `listening vs reading', `structural vs functional anaphora' and `four grade/age levels'. Moreover, most of the results shown in the graphs were clear-cut and elaborate statistical analysis was not necessary.

8. Results and discussion

8.0 Table 1 in the Appendix shows the means of the `zero group' and Table 2 in the Appendix shows the means of the `pronoun group'.

The following discusses the results categorized by the properties of the anaphora in the test items, namely, structural anaphora, functional anaphora, and orthographic cues on pronouns. The figures showing results of individual items are in the Appendix.

8.1 On Syntactic Restrictions in Anaphoric Resolution

8.1.1 AB items.

An example of AB:

NP_i saw NP_j, 0 then asked the teacher whether 0 could go to the playground.

Question for A: Who asked the teacher?

Question for B: Who wanted to go to the playground?

Figure 1 in the Appendix shows the results of anaphoric resolution of the subjects for Item A; Figure 2 shows those for Item B.

While the great majority of adult subjects agreed on NP_i being the antecedent of the anaphoric element in both A items and B items, children showed a developmental

approximation to the adults' resolution. This is particularly so with B items, judging from the generally upward curve shown in Fig. 2.

With items in A and B, on the whole, the younger the children, the greater was the tendency to pick NP_j as the antecedent.

With regard to language structure, the presence of the temporal conjuction *bian* (*then*) denotes a series of actions and the subject is deleted. This explains the first null subject. The second occurrence of a null subject, or the non-use of a lexical NP in the position where the second 0 is found, indicates that there is maintenance of the subject reference. So it is still NP_i who wanted to go to the playground. Apparently children have not fully understood the function of *bian* (*then*) and that because of its presence, the continued subject is deleted. The findings with this sentence structure indicate a developmental trend, suggesting that this kind of complexity is still not yet secured by children aged around twelve.

As regards `distance', NP_i is farther away than NP_j from the anaphoric element. With A items, the first null NP was questioned. All children performed differently from adults (means of NP_i: (G2 = .31, G4 = .38, G6 = .71; Ad = 1; $F(3, 59) = 11.75$, $p < .01$). The G6 children tended to pick NP_i in listening, approximating the adults' choice while the younger children did not. But with reading the A items, all children performed differently from adults (means of NP_i: G2 = .08, G4 = .38, G6 = .31, Ad = .93; $F(3, 58) = 19.23$, $p < .01$).

With B items in listening, the adults picked NP_i (mean: Ad = .98) while children in G2 picked NP_j (proportion of picking NP_j: G2 = .67). In reading, the adults also picked NP_i (mean: Ad = .91) while children in G2 tended to pick NP_j (proportion of picking NP_j: G2 = .92).

A conclusion obtained from Figures 1 and 2 is that the mean listening score of each group is higher than the mean reading score of that same group.

All this suggests that all subjects might find it easier to process complex structure like AB through listening. It is possible that the subjects in the listening mode benefited from the prosody in the processing of complex sentences, especially the pause after the first clause in which the two possible antecedents occur. That subjects in the reading mode did not benefit from the punctuation marks in the print could be due to competition from the demand of having to read aloud such complex sentences.

The sentence structure of items in A and B is apparently difficult for young children especially the G2 ones. And if reading is more difficult than listening in processing this structure, a suggestion obtained in the findings, then it is interesting to

note that the youngest group might have adopted some form of minimum distance strategy (reading means of A and B of G2 = .08; the listening means of A and B are .31 and .33 respectively) and tended to pick NP_j, the closer NP; meanwhile, the older children selected randomly (for example, reading means of B: G4 = .42; G6 = .53).

8.1.2 JK items.

A JK item is a complex sentence with a matrix clause and an embedded clause. There is a null NP followed by a pronoun.

An example of JK items:
NP_i saw NP_j, 0 then asked the teacher whether he could go to the playground.
Question for J: Who asked the teacher?

The question for J in fact asked for the resolution of the null NP. As can be seen from Figures 3 and 4, the adults picked NP_i as the answer (listening mean = .94, reading mean = .90). In listening, the children slightly favored the adult responses (means: G2 = .69, G4 = .65, G6 = .71). In reading, however, children differed from adults (means: G2 = .31, G4 = .60, G6 = .42; $F(3, 60) = 7.67$, $p < .01$).

The question for K asks for the resolution of the pronoun.

NP_i saw NP_j, 0 then asked the teacher whether he could go to the playground.
Question for K: Who wanted to go to the playground?

With K items, in both listening and reading, the adults picked NP_i (means = .90 and .88 respectively). But the children tended to be picking the answers randomly, as indicated by the means being around .50 (listening: G2 = .52, G4 = .50, G6 = .58, Ad = .90; $F(3, 60) = 4.41$, $p < .01$; reading: G2 = .33, G4 = .46, G6 = .46, Ad = .88; $F(3, 60) = 7.19$, $p < .01$; G2 children tended to pick NP_j 67% of the times). Indeed, all the children performed differently from the adults in listening and reading.

It seems that the adults had first interpreted the null NP (Item J) as `reference to the maintained-subject' (Chen, 1986) by picking NP_i and then interpreted the pronoun (Item K) in a manner as specified in the Binding Principles. On the other hand, the children simply picked the answers randomly, resulting in means around .50. These data suggest that pronouns are indeed ambiguous to children.

If the pronominal anaphora is indeed ambiguous to children, it is of little surprise that children's performance would be more adult-like with the J items (zero) than the K items (pronominal).

JK items and AB items look similar but are in fact different in one important aspect -- JK items contain a null NP followed by a pronoun but AB items each contain two null NPs. An observation is that resolution of a null NP is made more adult-like in the presence of a pronoun. Although with J (zero), children still performed differently from adults in general, children's mean scores for J were higher than their mean scores for A. It appeared that with two null NPs in a structure like the AB items, questions on either the first or the second null NPs present equal difficulty (Compare the listening means of A and B). But with a null NP followed by a pronoun like the structure in the JK items, children's resolution of the pronoun (K) was random; the resolution of the null NP (J) was much more adult-like, at least in listening. Another observation is that when B and K are compared, children's resolution of B, containing a null NP, shows development; their resolution of K, containing a pronoun, shows randomness.

After examining the results of AB and JK items, we can make the following points with regard to resolving functional and structural anaphora in complex sentences:

a) Developmental trends were shown in the resolution of both functional and structural anaphora.

b) In resolving functional anaphora, the younger children did not grasp the knowledge that the temporal conjunction *bian* (*then*) signifies a continued subject reference.

c) Children's performance in listening was on the whole more like adults' than in reading. They could have benefited from the pause after the possible antecedents in spoken language but not the comma in the same place in written language. This can be related to children's language experience being less in reading than in listening/speaking.

d) The adults' preferred choice in all these items was NP_i. The developmental trends were quite sharp and pointing upward (in particular Figure 1 and Figure 2), indicating that the younger the children, the stronger was the tendency to pick NP_j. NP_j is closer to the anaphoric element than NP_i is on the surface form. This might imply that children used a sort of minimum distance principle (MDP) in their anaphoric resolution. But until more data are examined, a conclusion on the effect of MDP in children's anaphoric resolution cannot yet been made.

e) Whether the anaphoric element was a null NP or pronoun was a significant syntactic factor affecting children's anaphoric resolution. The results of B show development whereas those of J show randomness in children.

8.1.3 CD items.

A CD item is a complex sentence with a matrix clause and an embedded clause containing a null subject.

An example of a CD item:
NP_i saw NP_j PRO ask the teacher whether 0 could go to the playground.
Question for C: Who asked the teacher?

With C items, the reference of PRO is controlled by NP_j and the children and adult tended to pick NPj as the answer. There were no statistically significant differences among the means in listening or reading.

An example of a D item:
NP_i saw NP_j PRO ask the teacher whether 0 could go to the playground.
Question for D: Who wanted to go to the playground?

As can be seen from Figures 5 and 6, with listening to D items, the older subjects tended to choose NP_j (proportion of picking NP_j: G6 = .85; Ad = .81) and the youngest subjects tended to choose at random (mean: G2 = .47). G2 children differed from G6 children and adults ($F(3, 59) = 3.41$, $p < .05$). With reading, all subjects tended to choose NP_j.

The null NP in the embedded clause was questioned in D. G2 children seemed to be not secure when listening to this complex structure (mean: G2 = .47) with the antecedent of the null subject some distance away (with an intervening NP '*the teacher*'). But with reading identical items, G2 children seemed to be much more secure in their interpretation (proportion of picking NP_j = .85). An explanation is proposed: the sentence structure does not warrant a pause or a comma after the two possible antecedents. Children had no pausing to benefit from in listening. But they could have adopted a strategy of 'look-back' in reading.

In resolving structural anaphora as in C, children made the same preferred choice as the adults. But in resolving structurally anaphoric elements occurring in a deeply embedded clause as in D, the youngest children performed like adults in reading but made random choices in listening. With CD items, we could say that in resolving structural anaphora, children were, like adults, constrained by a set of hypotheses on language structure vis-a-vis the Binding Principles. But children were not always in good control of those principles. Their anaphoric resolution could be affected by syntactic factors such as embedding and cognitive factors such as surface distance between the anaphoric elements and their antecedents. This resulted in their anaphoric resolution being different from adults'.

8.1.4 LM items.

An LM item is a complex sentence with a matrix clause and an embedded clause containing a pronoun.

An example of an LM item:
NP_i saw NP_j PRO ask the teacher whether he could go to the playground.
Question for L: Who asked the teacher?

With L items, the reference of PRO is controlled by NP_j. Figures 7 and 8 show that the G2 children and the adults showed significant between-group difference in listening (proportion of picking NP_j: G2 = .40, G4 = .58, G6 = .65, Ad = .83; $F(3, 60) = 4.0$; $p < .05$), with the G2 children tending to pick NP_i, and the adults, NP_j. G2 children differed from the G6 children and adults in reading L (mean proportion of picking NPj: G2 = .67; G4 = .77, G6 = .92; Ad = .94; $F(6, 60) = 3.0$, $p < .05$).

The structure of L is the same as that of C. It is interesting to note that children's reading means of C and L are quite similar; but this is not the case with their listening means of C and L. There is no between-group difference in listening to C, but the youngest children differed from adults when listening to L. The clause embedded in C contains a null NP (i.e., as in D), the embedded clause contained in L contains a pronoun (i.e., as in M). So whether the later-occurring anaphoric element is a null NP or a pronoun has some effect on the resolution of the earlier occurring anaphoric element. Furthermore, when D and M are compared, it is observed that children's resolution of D, containing a null NP, was more like adults' than their resolution of M, which contains a pronoun. Item M is explained below.

With M items, the pronoun in the embedded clause of the complex sentence LM was questioned.

An example of M:
NP_i saw NP_j PRO ask the teacher whether he could go to the playground.
Question for M: Who wanted to go to the playground?

The adults tended to pick NP_j, with the proportions of picking NP_j in listening and reading being respectively .81 and .85. There was significant between-group difference in listening with G2 children (proportion of picking NP_j: G2 = 0.40, G4 = .54, G6 = .60, Ad = .81; $F(3, 60) = 3.38$, $p < .05$).

In listening to M, children tended to choose randomly (proportion of picking NP_j: G2 = .40, G4 = .54, G6 = .60, Ad = .81; $F(3, 60) = 3.38$, $p < .05$).

After examining the results of CD and LM items, we can make the following points with regard to resolving structural anaphora in complex sentences:

a) In general children made the same preferred choice as adults, in these cases, NP_j, although developmental trends were shown. This is indicated by the curves in Figures 5 to 8 being in the lower half of the figures.

b) The younger children's performance was more like adults' in reading than in listening. An explanation is proposed: the sentence structure does not allow a pause or a comma to be placed after the two possible antecedents. In reading, children could have adopted some sort of minimum distance principle (MDP) in the form of `look-back' and picked the closer NP, i.e., NP_j. However, unlike their performance on the reading items AB and JK, children did not have the benefit of the pause in listening; This consideration leads to the following point:

c) The possibility that children used MDP in anaphoric resolution in complex sentences still holds. With the data, we conclude that the constraints on structural anaphora as specified in the Binding Principles hold for children and adults (cf. results of C items). But children were not always in good control of those principles. Factors that could have affected their interpretation were the presence of syntactic factors such as embedding and whether the anaphoric element is a null NP or pronoun, and cognitive factors such as surface distance between the anaphoric element and the antecedent. Children's interpretation of null NPs (as in D) was more like adults' than their interpretation of pronouns (as in M). In a sentence with two anaphoric elements, if the second element is a pronoun (as in L), children's resolution of the first element tended to be less like adults' than if the second one is a null NP (as in C). (cf. differences in listening to C and L.)

8.1.5 G items.

The G items are existential clauses with a linear form of NP-V-NP-VP (cf. example (1)). The VP is a predicate of the second NP.

An example of G:
NP_i has a NP_j (e.g. `a neighbor') is a Shanghainese.
Question: Who is a Shangainese?

As shown in Figure 9, all subjects tended to pick NP_j as the answer in listening and reading. The older children's performance was closer to the adults' (Proportion of picking NP_j in listening: G2 = .87, G4 = .96, G6 = .94, Ad = 1; in reading: G2 = .87, G4 = .98, G6 = .98, Ad = .94.) There were no statistically significant differences among the means in listening or reading.

8.1.6 H items.

H items are existential sentences with a linear form of NP-V-NP-AP (cf. example (5) above). The AP is a predicate of the second NP.

An example of H:
NP_i drew an NP_j (e.g. `a superman') very good looking.
Question: Who was good looking?

The results in Figure 10 show that the older children and adults tended to choose NP_j in both listening and reading. G2 children were significantly different from all others in listening (proportion of picking NP_j: G2 = .73, G4 = .94, G6 = .98, Ad = .96; $F(3, 60) = 4.9$, $p < .01$). G2 children were different from G6 children and adults in reading (proportion of picking NP_j: G2 = .71, G4 = .87, G6 = .94, Ad = 1; $F(3, 59) = 4.5$, $p < .01$).

The results were similar to those of G items. We find that G2 children showed significant differences from the older children and adults in listening and reading.

After examining the results of G and H items, we can make the following points with regard to the resolution of anaphora in existential sentences:

The structure of existential sentence is not as complex as that of AB, JK, CD and LM, which we have discussed earlier. The anaphora in existential sentences is structurally controlled, i.e., the XP (VP in items G and AP in items H) is a predicate of the second NP. The preferred choice of children and adults was clearly NP_j. This suggests that children and adults formed the same hypothesis on this structure, being restricted by the same principles for anaphoric resolution. However, one can argue that children might have used the minimum distance principle (MDP) in anaphoric resolution and picked the closer NP, namely, NP_j, which happened to be the adults' preferred choice. The question of MDP in interpreting existential sentence will be answered when we come to Items I in the following section.

8.2 On the Continuation or Switch of the Subject Reference in Anaphoric Resolution

An item in E (with a null NP) and an item in N (with a pronoun) is composed of two simple clauses, with the temporal conjunction *bian* (*then*) joining the two clauses.

8.2.1 E items.

An example of E:
NP_i hit NP_j, then 0 immediately went away
Question: Who went away?

The presence of the temporal conjunction *bian* (*then*) signifies a continued-reference subject and therefore a null subject is used in the second clause. As can be seen from Figure 11, the adults tended to choose NP_i in both listening and reading (Ad listening mean = .94; reading mean = 1), and so did the older children (listening means: G4 = 0.81, G6 = .88; reading means: G4 = .63, G6 = .69). Significant differences were found between G2 children and all other groups in listening ($F(3, 60) = 7.75$, $p < .001$) and reading ($F(3, 60) = 10.09$, $p < .001$) . The means of G2 children were around .50 (G2 listening mean = .54; reading mean = .40).

The function of the temporal conjunction *bian* (*then*) at the beginning of the second clause has not been understood by G2 children. Its presence signifies a continued subject reference, resulting in the use of a null subject NP in the second clause. While the adults' answers showed a preferred choice of NP_i, the youngest children's answers were quite random. This leads us to conclude that `grammatical' or `function' words like conjunctions are difficult for G2 children.

A mean around .50 means equal proportions of NP_i and NP_j having been picked. This suggests that children did not secure the knowledge of the deletion of a continued subject signified by the conjunction. Children might have found the items ambiguous. The clauses were short and not complex like AB items, so it was only the youngest children who still had not grasped the knowledge (compared with the AB items with which even the older children selected answers randomly). The results of E suggest a developmental trend of grasping the knowledge of `switched / maintained subject' at around age ten, the mean age of the G4 children.

The means of the listening and reading items in E suggest that with clauses of simple structure, children performed more like adults in listening. This is not the case with complex clause structure like M items, for example.

8.2.2 N items.

An N item is composed of two simple independent clauses joined by the temporal conjunction *bian* (*then*). A pronoun occurs in the second clause.

An example of N:
NP_i hit NP_j. He then immediately went away.
Question: Who went away?

With the pronominal anaphora in this construction, no two groups showed significant difference in listening or reading.

Figure 12 indicates that the adults tended to choose NP_i as the antecedent of the pronoun (listening mean = .73; reading mean = .63). But the proportion of NP_i being picked as the antecedent of the null NP was higher (items E, Ad listening mean = .94; reading mean = 1). The perception of ambiguity in pronominal anaphora was prominent with the children (listening mean of G2 = .48, G4 = .67, G6 = .65; reading means of G2 = .42, G4 = .33, G6 = .48). This suggests that children were sensitive to the fact that a pronoun in the second clause is ambiguous in the sense that it can signify the maintenance or switch of the subject reference (Chen 1984).

After examining the results of items E and N, we can make the following points with regard to resolving functional anaphora in simple independent clauses:

a) The younger children (up to about age ten) did not grasp strongly the knowledge that the temporal conjunction *bian* (*then*) signifies a continued subject reference. This agrees with the point made earlier in the discussion about items A and J, which are functional anaphoric elements in complex clauses and in the resolution of those items children as old as twelve did not show consolidated knowledge about the temporal conjunction.

b) It is suggested that the younger children did not employ minimum distance principle (MDP) in anaphoric resolution as they might have done with complex clauses (e.g. items AB). Instead a mean around .50 was found in children's performance with both items E and N and developmental approximation to adult performance was found with older children in resolving N items. This suggests that children were sensitive to the manintenance or switch of the subject reference.

c) Children's performance in listening was in general more like adults' than in reading.

d) Whether the anaphoric element is a null NP or pronoun was a significant factor affecting anaphoric resolution. Even adults did not have as clear a preferred choice with pronouns (N) than with null NPs (E).

8.2.3 F items.

F Items (Fig. 13) and O items (Fig. 14) are of the same structure; each item consists of two simple independent clauses with no conjunction intervening. F items contain null NPs; O items contain pronouns.

An example of F:
It was raining. NP_i looked at NP_j. 0 had not taken out an umbrella.
Question: Who hadn't taken out an umbrella?

No two groups showed significant difference in listening or reading. It should be noted that the means of all groups were around .50. Judging from the results, the items could be said to be pragmatically ambiguous. NP_i had not taken out an umbrella because he was busy looking at NP_j. Or that NP_j had not taken out an umbrella was what NP_i saw. In the first case, the zero anaphoric element was construed to be the maintained-reference subject (NP_i). In the second case, the zero anaphoric element was construed to be the switched-reference subject (NP_j).

8.2.4 O items.

An example of O:
It was raining. NP_i looked at NP_j. He had not taken out an umbrella.
Question: Who hadn't taken out an umbrella?

The listening means (see Figure 14) were: G2 = .50, G4 = .44, G6 = .39, Ad = .25; $F(3, 60) = 3.86$, $p < .05$. The means of Ad and G2 and Ad and G4 were statistically significant. The adults tended to pick NP_j as the antecedent of the pronoun *ta* (*he*) while the younger children found the antecedent ambiguous.

In reading, no two groups were found to be significantly different. (Proportion of picking NP_j: G2 = .68, G4 = .71, G6 = .65, Ad = .56.)

Items F and O which consist of functional anaphora in simple independent non-conjoined clauses can provide a clearer view of the resolution of functional anaphora in terms of a) children's sensitivity to maintenance or switch of subject reference and b) the differences in the resolution of null subjects and pronoun subjects.

a) Children and adults found the null NPs in items F ambiguous. The choice of NP_i as the antecedent can be interpreted as a maintained-reference subject and the choice of NP_j, a switched-reference subject (Chen, 1986). Children's judgment was similar to the adults'. Like adults, children were sensitive to the maintenance or switch of subject reference. This point has also been made earlier in the discussion on items N.

b) That adults interpreted a null subject in the second non-conjoined clause as ambiguous (F items) but a pronoun subject in the same clause as a switched-reference subject (O items, Ad listening mean of NP_j = .75) suggests that adults judged the use of pronouns as mainly marked to introduce unexpected information. With less language experience than adults, children had yet to learn that the use of pronouns is marked.

8.2.5 I items.

I items each consist of two simple clauses. The anaphora is functional in nature. The first clause contains NPi and NPj; the second clause contains a null NP and a predicate of adjectival phrase.

I items are not existential sentences although they bear a surface form similar to those in H. The selection restrictions of the adjectival phrase, e.g. `*happy*', determines the reference between the null NP and $NP_i$, an `experiencer' (cf. example (6) above).

An example of I:
NP_i drew NP_j (e.g. `a fairy'), 0 very happy.
Question: Who was very happy?

With the I items, there was no difference among the group means in listening or reading. All subjects tended to pick NP_i. (Listening means: G2 = .96, G4 = .96, G6 = .92, Ad = 1; reading means: G2 = .96, G4 = .92, G6 = .92, Ad = .98)

Children's adult-like anaphoric resolution with I items could be attributed to their understanding of the selection restrictions of the adjectival phrase in the second clause which determine that NP_i is the antecedent.

But it can be argued that NP_j ('*a fairy*') can also be an experiencer predicated by the adjectival phrase ('*to be happy*'). To address this question, we can argue that pragmatically the selection restrictions of the adjectival phrase are better specified for humans (NP_i) than for fictitious characters (NP_j).

Moreover, by choosing NP_i as the antecedent, children showed an ability in maintaining thematic subject reference in anaphoric resolution (cf. Karmiloff-Smith's 'thematic subject constraint' (1980). In terms of semantic roles, NP_i is the 'agent' and NP_j is the 'object'. Children, like adults, appropriately picked the NP of the same semantic role, NP_i, as the antecedent (cf. Maratsos's 'semantic role principle', 1974). The results strongly suggest that children did not use the surface-structure minimum distance principle (MDP) to resolve anaphora in this structure (cf. C. Chomsky's minimum distance principle, 1969). If MDP was used, children could not have gotten the same preferred antecedent as the adults in I, which was NP_i.

Let us recall that item H (existential sentence) and item I bear a similar surface form but H contains syntactic anaphora whereas I contains functional anaphora. The preferred choice for H and I was different. NP_j was for H and NP_i was for I. Children and adults made the same preferred choices. These results show that children, like

adults, formed different hypotheses on the two sentence structures. We can conclude that children have acquired constraints and restrictions on structural and functional anaphora similar to adults' in these language structures.

8.3 **On Orthographic Information on Anaphoric Resolution**

8.3.1 P and Q items.

Items in P and Q are complex sentences of the same structure. An adverbial clause is followed by the main clause. NP_i and NP_j in the first clause are names of opposite sexes. The pronominal anaphor *ta* (*he*) is in the second clause.

In writing, the character *ta* has a gender radical. In speaking, *he* and *she* sound the same: *kuei* in Cantonese, *ta* in Mandarin.

In P items, the written *ta* always denotes the same gender as NP_i (cf. (9) above). In Q items, the written *ta* always denotes the same gender as NP_j (cf. (10) above).

An example of P (in writing):
(when) brother saw Jenny, he was eating.
Question: Who was eating?

An example of Q (in writing):
(when) Jenny saw brother, he was studying.
Question: Who was studying?

As shown in Figures 16 and 17, there was no between-group difference in listening to either P or Q. The proportions of picking NP_j in listening to P are: G2 = .77, G4 = .69, G6 = .73, Ad = .81 (Fig. 16). The proportion of picking NP_j in listening to Q are: G2 = .58, G4 = .67, G6 = .79, Ad = .77 (Fig. 17).

But in reading P items, all children differed from the adults but did not differ among themselves in that children tended to pick NP_j but adults tended to pick NP_i (means: G2 = .25, G4 = .35, G6 = .31, Ad = .77; $F(3, 60) = 6.02$, $p < .01$). Adults' listening mean (.19) and reading mean (.77) were significantly different.

In reading Q items, G2 children differed from all other subjects. (Proportion of picking NP_j: G2 = .75, G4 = .98, G6 = .98, Ad = .98; $F(3, 60) = 5.20$, $p < .01$).

P and Q items are of the same structure, and the pronouns are in theory ambiguous when heard. The same verb *kanjian* (*to have seen*) is used in the first clause of each item. In listening, when orthographic information of the pronoun was

not applicable, all subjects tended to choose NP_j. It showed that there was a general understanding that NP_j was the actor in the scene of what NP_i had seen. To choose NP_i as the antecedent of the pronoun in the second clause would be counter to this understanding. In other words, the pronoun was generally regarded as referring to a switched-reference subject in the listening mode. Yet the orthographic information of the pronoun in P in reading is counter to this understanding. Only adults made use of the orthographic information to make choices even though it might be `unnatural' to do so. This was possible with adults and not children because adults usually have much more experience with reading than children to let orthographic information override a more natural interpretation.

When orthographic information did not contradict the general understanding, such as when reading the Q items, only the youngest children seemed not to be making use of the orthographic information, by producing a mean the same as that of reading P. The results agree with Karmiloff-Smith's argument (1980) that children do not necessarily make use of devices like gender distinctions of pronouns in a language.

9. Summary

Some types of anaphora are acquired early but some have to be learned from language experience. This is what this study has shown when children's anaphoric resolution is measured against that of the adults'. School-age children (Grade 2, Grade 4 and Grade 6 in this study) in some instances resolved anaphora differently from adults. The factors affecting children's anaphoric resolution as investigated in this study are: the types of anaphora (syntactic and functional null and pronominal anaphora), the linguistic context in which the anaphora appears (in terms of the complexity of sentence structure such as embedding, the presence of conjoining conjuction, and the surface distance between the antecedent and the anaphoric element), the mode from which the anaphora is received (through listening or reading) and the amount of learning the children already possess (the grade/age levels).

The data of resolution of structural anaphora with complex sentences (cf. items C) and less complex structure (cf. items G and H) in general support the notion that children consult structure in some ways in anaphoric resolution. But this study is not specific about the syntactic constraints as represented by the Binding Principles such as 'c-command' and 'domain'.

There were developmental differences in some instances in complex sentence structure. It is concluded that syntactic factors and cognitive factors can affect children's resolution of syntactic anaphora.

A syntactic factor that affected children's anaphoric resolution is sentence complexity. If the syntactically determined null anaphora appeared in a complex

sentence, for example the AB items, children's anaphoric resolution was different from the adults'.

Another syntactic factor that affected children's anaphoric resolution is embedding. When the anaphoric element occurs in a deeply embedded clause, for example the D and M items, children performed differently from adults.

When faced with difficulties such as sentence complexity and embedding, children may adopt a surface-structure strategy. For example, Grade 2 children seemed to have employed some strategy of 'look back' when reading complex sentences (cf. D items).

A syntactic factor found to be affecting children's resolution is whether the anaphor is a null NP or pronoun. For example, resolving structural pronouns in complex sentences was less adult-like than resolving null NPs in similar structures (cf. D and M). Also, the interpretation of an anaphoric element was affected by the type of the following anaphoric element in a complex structure. It was noted that if the second anaphoric element is a pronoun, then the resolution of the first was less adult-like than if the second one is a null NP. For example, the A and B items, which are `zero-zero' (containing two null NPs) presented equal difficulties to children. CD items, which are of the `zero-pronoun' type (with the first anaphoric element being a null NP and the second a pronoun), induced more adult-like answers of C from children (cf. results of JK items and AB items).

In resolving functional anaphora, children were found to be sensitive to maintenance and switch of subject reference like adults (cf. results of the ambiguous test items of F and O). Children showed fairly good thematic control of the subject reference with simple clauses, for example, the I items, P items in listening, and Q items. There was no evidence that children adopted a strategy like `minimum distance principle' in resolving functional anaphora. But they had not learned that the use of pronouns is marked in Chinese (cf. O items).

With functional anaphora too, whether the anaphoric element is a null NP or pronoun affected anaphoric resolution, including the adults'. When results of E, containing a null anaphor, and N, containing a pronoun, are compared, a preferred choice was more apparent in E than in N. That pronouns can be used for switched- or maintained- reference subject can explain why children found it ambiguous and adults showed a less clear preferred choice. But a null NP in conjoined clauses signifies one phenomenon: that the predictability of the subject reference is high and therefore a null NP is used.

Grammatical knowledge such as that expressed in temporal conjunctions like *bian* (*then*) had not been grasped by Grade 2 children to help resolve zero anaphora (cf. E items). In contrast, lexical knowledge was applied by all children (and adults) in anaphoric resolution (cf. I items).

Regarding knowledge from language experience, children did not make use of orthographic information to disambiguate pronouns (cf. P in writing).

There is an overall impression that children's resolution approximated the adults' if the anaphora was given through listening than through the subjects' own reading. Children are still learning to read. The results of reading P items show that only adults would allow orthographic information to override the decisions they would otherwise have made in listening. In simple clauses, however, only Grade 2 children did not take note of orthographic information (cf. Q items). This shows that some anaphoric resolutions are related to the amount of language experience in reading.

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Appendix

Table 1: Means of the Zero-Group

	G2		G4		G6		Ad	
Item Groups	L	R	L	R	L	R	L	R
A	.31	.08	.38	.38	.71	.31	1.0	.93
B	.33	.08	.46	.42	.77	.53	.98	.91
C	.31	.33	.25	.21	.15	.10	.11	.13
D	.47	.15	.25	.17	.15	.08	.19	.08
E	.54	.40	.81	.63	.88	.69	.94	1.0
F	.52	.37	.49	.37	.48	.44	.42	.42
G	.13	.13	.04	.02	.06	.02	0.0	.06
H	.27	.29	.06	.13	.02	.06	.04	0.0
I	.96	.96	.96	.92	.92	.92	1.0	.98

Note. 'G2', 'G4', 'G6' and 'Ad' stand for 'Grade 2', 'Grade 4', 'Grade 6' and 'adults' respectively. 'L' and 'R' stand for 'listening' and 'reading' respectively.

Table 2: Means of the Pronoun-Group

	G2		G4		G6		Ad	
Item Groups	L	R	L	R	L	R	L	R
J	.69	.31	.65	.60	.71	.42	.94	.90
K	.52	.33	.50	.46	.58	.46	.90	.88
L	.60	.33	.42	.23	.35	.08	.17	.06
M	.60	.42	.46	.23	.40	.13	.19	.15
N	.48	.42	.67	.33	.65	.48	.73	.63
O	.50	.32	.44	.29	.39	.35	.25	.44
P	.23	.25	.31	.35	.27	.31	.19	.77
Q	.42	.25	.33	.02	.21	.02	.23	.02

Note. 'G2', 'G4', 'G6' and 'Ad' stand for 'Grade 2', 'Grade 4', 'Grade 6' and 'adults' respectively. 'L' and 'R' stand for 'listening' and 'reading' respectively.

Figure 1: Item A

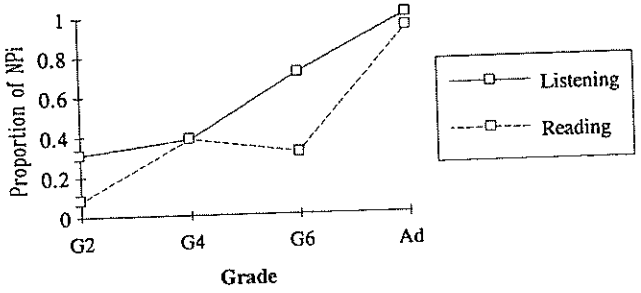


Figure 2: Item B

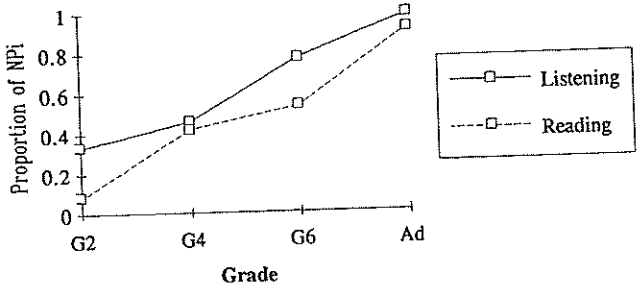


Figure 3: Item J

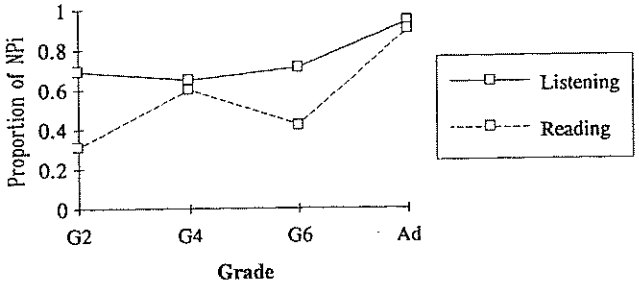


Figure 4: Item K

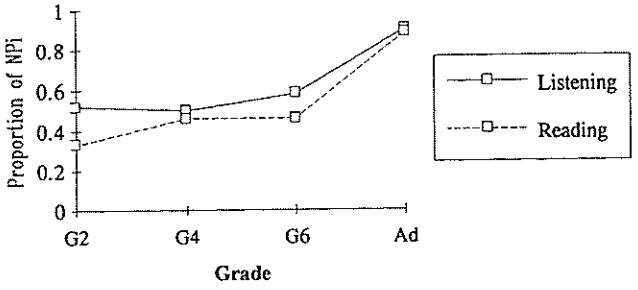


Figure 5: Item C

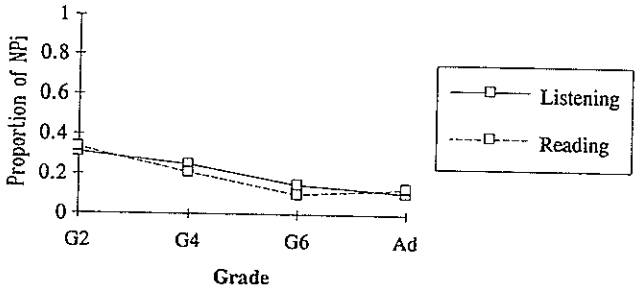


Figure 6: Item D

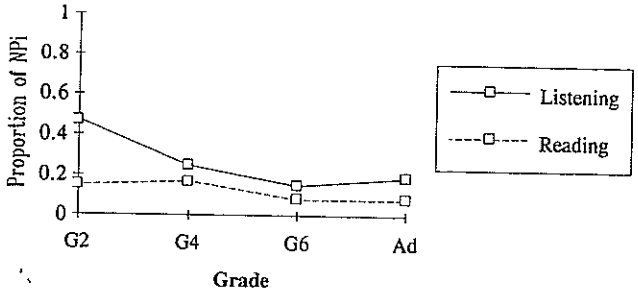


Figure 7: Item L

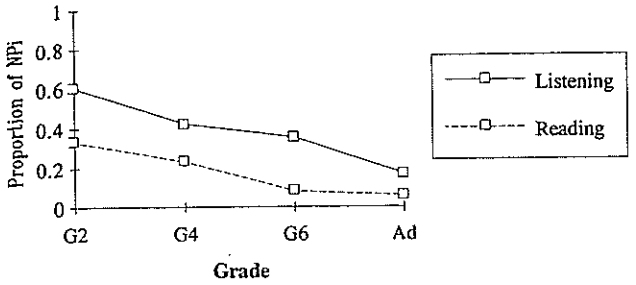


Figure 8: Item M

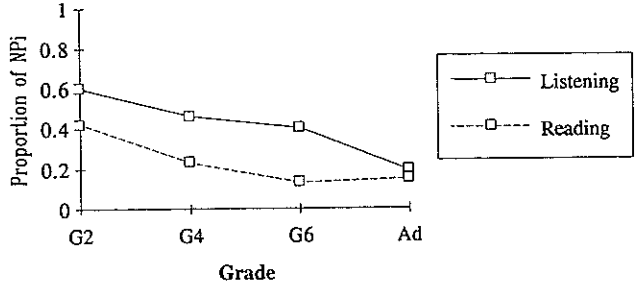


Figure 9: Item G

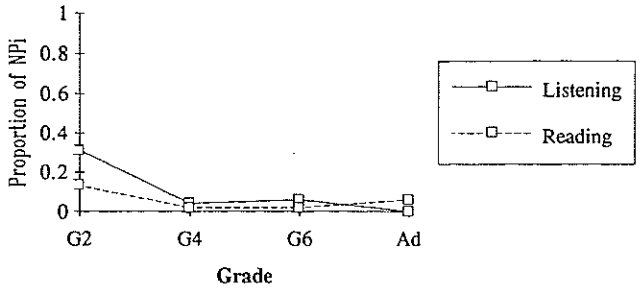


Figure 10: Item H

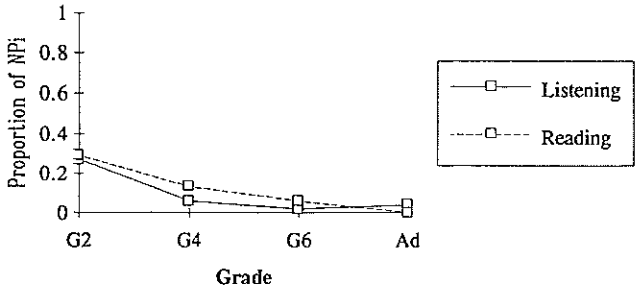


Figure 11: Item E

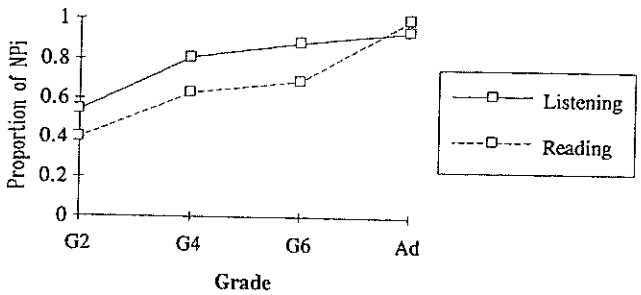


Figure 12: Item N

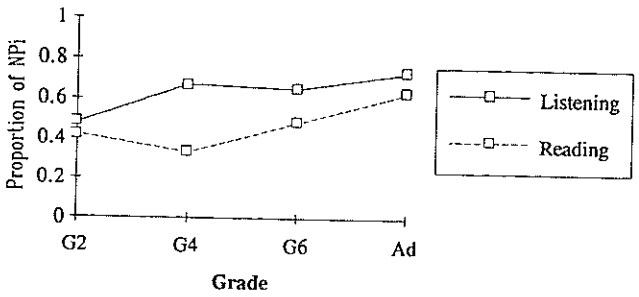


Figure 13: Item F

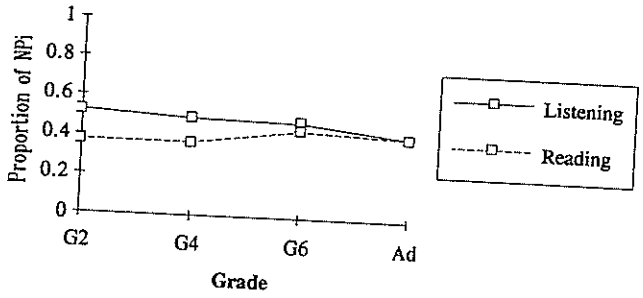


Figure 14: Item O

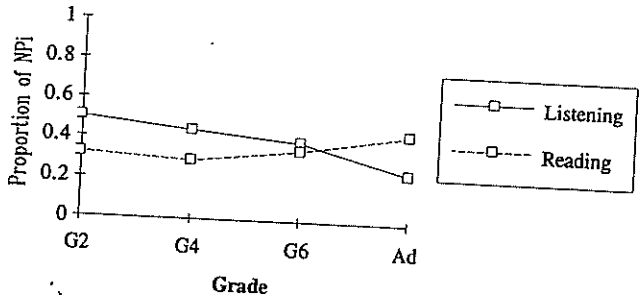


Figure 15: Item I

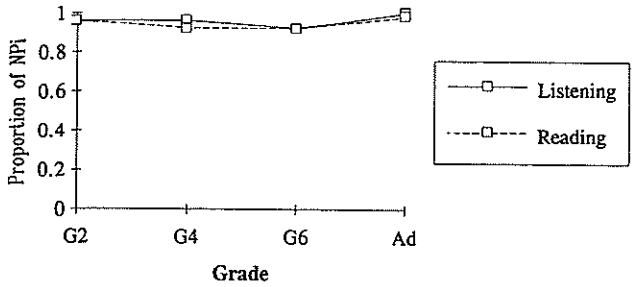


Figure 16: Item P

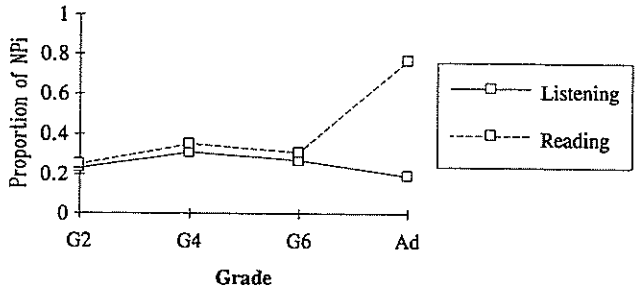
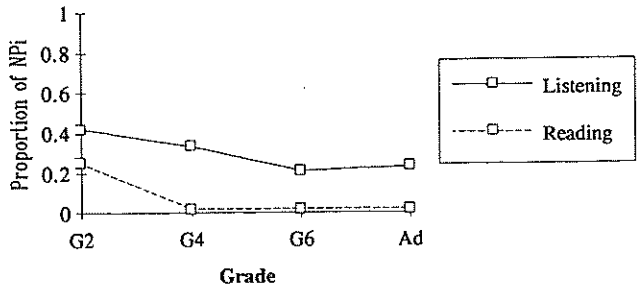


Figure 17: Item Q



Test Items

Zero-Group Anaphora

Key:
1st verse: Mandarin Chinese
2nd verse: Chinese characters
3rd verse: Cantonese Chinese
4th verse: English
5th verse: Question

A - Fig.1

1

Xiao Hong jiandao Xiao Li, 0 bian wen laoshi 0 keyi bu keyi dao yinyueshi qu.

小紅見到小麗，便問老師可以不可以到音樂室去。

Siu Hung gin dou Siu Lai, jau man sin saang ho m ho yi dou yam ngok sat.

Siu Hung saw Siu Lai, 0 then asked the teacher whether 0 could go to the music roo

(Question: Who asked the teacher?)

2

Mei Mei jiandao Zhen Ni, 0 bian wen laoshi 0 keyi bu keyi dao caochangshang qu.

美美見到珍妮，便問老師可以不可以到操場上去。

Mei Mei gin dou Jan Nei, jau man sin saang ho m ho yi dou chou cheung heui.

Mimi saw Jenny, 0 then asked the teacher whether 0 could go to the playground.

(Question: Who asked the teacher?)

3

De Ming jiandao Zhi Qiang, 0 bian wen banzhuren 0 keyi bu keyi dao litang qu.

德明見到志強，便問班主任可以不可以到禮堂去。

Dak Ming gin dou Ji Keung, jau man baan jyu yam ho m ho yi dou lai tong.

Tak Ming saw Chi Keung, 0 then asked the form teacher whether 0 could go to the hall.

(Question: Who asked the form teacher?)

B - Fig.2

1

Bi De jiandao Guo Qiang, 0 bian wen laoshi 0 keyi bu keyi dao caochangshang qu.

彼德見到國強，便問老師可以不可以到操場上去。

Bei Dak gin dou Gwok Keung, jau man sin saang ho m ho yi heui chou cheung.

Peter saw Kwok Keung, 0 then asked the teacher whether 0 could go to the playground.

(Question: Who wanted to go to the playground?)

2

Xiao Hui jiandao Xiao Mei, 0 bian wen banzhuren 0 keyi bu keyi dao litang.

小惠見到小美，便問班主任可以不可以到禮堂去。

Siu Wai gin dou Siu Mei, jau man baan jyu yam ho m ho yi heui lai tong.

Siu Wai saw Siu Mei, 0 then asked the teacher whether 0 could go to the hall.

(Question: Who wanted to go to the hall?)

3

Zhen Ni jiandao Xiao Hong, 0 bian wen laoshi 0 keyi bu keyi dao yinyueshi qu.

珍妮見到小紅，便問老師可以不可以到音樂室去。

Jan Nei gin dou Siu Hung, jau man sin saang ho m ho yi dou yam ngok sat.

Jenny saw Siu Hung, 0 then asked the teacher whether 0 could go to the music room.

(Question: Who wanted to go to the music room?)

C - Fig.5

1

Zhen Ni jiandao Mei Mei wen laoshi, 0 keyi bu keyi dao laozuoshi qu.

珍妮見到美美問老師，可以不可以到勞作室去。

Jan Nei gin dou Mei Mei man lou si, ho m ho yi dou lou jok sat heui.

Jenny saw Mimi ask the teacher, whether 0 could go to the art room.

(Question: Who asked the teacher?)

2

Xiao Ming jiandao Xiao Qiang wen laoshi, 0 keyi bu keyi dao yinyueshi qu.

小明見到小強問老師，可以不可以到音樂室去。

Siu Ming gin dou Siu Keung man lou si, ho m ho yi dou yam ngok sat heui.

Siu Ming saw Siu Keung ask the teacher, whether 0 could go to the music room.

(Question: Who asked the teacher?)

3

Bi De jiandao Zhi Ming wen laoshi, 0 keyi bu keyi dao caochangshang qu.

彼德見到國強問老師，可以不可以到操場上去。

Bei Dak gin dou Ji Ming man lou si, ho m ho yi dou chou cheung heui.

Peter saw Chi Ming ask the teacher, whether 0 could go to the playground.

(Question: Who asked the teacher?)

D - Fig.6

1

Xiao Qiang jiandao Xiao Ming wen laoshi, 0 keyi bu keyi dao caochangshang qu.

小強見到小明問老師，可以不可以到操場上去。

Siu Keung gin dou Siu Ming man lou si, ho m ho yi dou chou cheung heui.

Siu Keung saw Siu Ming ask the teacher, whether 0 could go to the playground.

(Question: Who wanted to go to the playground?)

2

Zhi Wen jiandao Bi De wen laoshi, 0 keyi bu keyi dao laozuoshi qu.

志文見到彼德問老師，可以不可以到勞作室去。

Ji Man gin dou Bei Dak man lou si, ho m ho yi dou lou jok sat heui.

Chi Man saw Peter ask the teacher, whether 0 could go to the art room.

(Question: Who wanted to go to the art room?)

3

Xiao Li jiandao Xiao Zhen wen laoshi, 0 keyi bu keyi dao yinyueshi qu.

小麗見到小珍問老師，可以不可以到音樂室去。

Siu Lai gin dou Siu Jan man lou si, ho m ho yi dou yam ngok sat heui.

Siu Lai saw Siu Jan ask the teacher, whether 0 could go to the music room.

(Question: Who wanted to go to the music room?)

E - Fig.11

1

Xiao Hua dale Xiao Qiang laingxia, bian jimangde zoukai le.

小華打了小強兩下，便急忙走開了。

Siu Wa da jo Siu Keung leung ha, bin gap mong gam jau hoi heui.

Siu Wah hit Siu Keung twice. Then 0 immediately went away.

(Question: Who immediately went away?)

2

Xiao Hong xiang Xiao Li ban ge guilian, bian lianmang zoukai le.

小紅向小麗扮個鬼臉，便連忙走開了。

Siu Hung heung Siu Lai baan go gwai lim, bin lin mong jau hoi heui.

Siu Hung made grimaces to Siu Lai. Then 0 immediately went away.

(Question: Who immediately went away?)

3

De Ming paile Guo Qiang yixia, bian lianmang zoukai le.

德明拍了國強一下，便連忙走開了。

Dak Ming paak jo Gwok Keung yat ha, bin lin mong jau hoi heui.

Tak Ming gave Kok Keung a tap. Then 0 immediately went away.

(Question: Who immediately went away?)

F - Fig.13

1

Tiyuke shangwan le.
Xiao Mei wangzhe Xiao Hong, 0 hai meiyou huan hao yifu.

體育課上完了。小美望著小紅，還沒有換好衣服。

Tai yuk tong seung yun lak.
Siu Mei mong jyu Siu Hung, jung mei wun hou yi fuk.

The gymnastics class was over.
Siu Mei looked at Siu Hung, 0 had not changed clothes yet.

(Question: Who had not changed yet?)

2

Xiake le.
Zhi Qiang wangzhe Bi De, 0 hai meiyou ba shubao shoushi hao.

下課了。志強望著彼德，還沒有把書包收拾好。

Lok tong lak.
Ji Keung mong jyu Bei Dak, jung mei jeung syu baau sau sap hou.

The class was over.
Chi Keung looked at Peter, 0 had not packed the school-bag yet.

(Question: Who had not packed the school-bag yet?)

3

Xianzai xiazhe yu.
Zhen Ni wangzhe Mei Mei, 0 hai meiyou ba yusan nachulai.

現在下著雨。珍妮望著美美，還沒有把雨傘拿出來。

Yi ga lok gan yu.
Jan Nei mong jyu Mei Mei, jung mei jeung je lo cheut lei.

It is raining now.

Jenny looks at Mimi, 0 has not taken out an umbrella yet.

(Question: Who had not taken out an umbrella yet?)

4

Baba baozhe yige xiaohaizi, 0 liekaiju xiao.

爸爸抱著一個小孩子，咧開嘴笑。

Ba ba pou jyu yat go sai man jai, lit hoi jeui siu.

Daddy was holding a child, 0 grinned.

(Question: Who grinned?)

5

Xiao Ming kandao Xiao Qiang, 0 hen jinghuangde paokai qu.

小明看到小強，很驚慌地跑開去。

Siu Ming tai dou Siu Keung, hou ging fong gam paau hoi heui.

Siu Ming saw Siu Keung, 0 ran away fearfully.

(Question: Who ran away fearfully?)

6

Bi De zai maxituan kanjian xiaochou, 0 liekaiju xiao.

彼德在馬戲團看見小丑，咧開嘴笑。

Bei Dak hai ma hei tyun tai gin.siu chau, lit hoi jeui siu.

Peter saw a clown in the circus, 0 grinned.

(Question: Who grinned?)

G - Fig.9

1

Guo Qiang zhaodaole yige buxi laoshi, 0 zhuzai Beijiao.

國強找到了一個補習老師，住在北角。

Gwok Keung wan dou yat go bou jaap sin saang, jyu hai Bak Gok.

Kwok Keung has found a private tutor, 0 lives in North Point.

(Question: Who lives in North Point?)

2

Zhen Ni you ge pengyou, 0 you congming you liangshan.

珍妮有個朋友，又聰明又良善。

Jan Nei yau go pang yau, yau chung ming yau leung sin.

Jenny has a friend, 0 is intelligent and kind.

(Question: Who is intelligent and kind?)

3

Zhi Ming you ge linju, 0 shi Shanghairen.

志明有個鄰居，是上海人。

Ji Ming yau go leun geui, hai Seung Hoi yan.

Chi Ming has a neighbour, 0 is Shanghainese.

(Question: Who is Shanghainese?)

H - Fig.10

1

Bi De huale yige chaoren, 0 shifen haokan.

彼德畫了一個超人，十分好看。

Bei Dak waak jo yat go chiu yan, fei seung hou tai.

Peter drew a superman, 0 very good-looking.

(Question: Who was very good-looking?)

2

Xiao Ming huale yige xiaoxiannu, 0 shifen youqu.

小明畫了一個小仙女，十分有趣。

Siu Ming waak jo yat go siu sin neui, sap fan yau cheui.

Siu Ming drew a little fairy, 0 very interesting.

(Question: Who was very interesting?)

3

Xiao Hong huale yige xiaohaizi, 0 shifen ke ai.

小紅畫了一個小孩子，十分可愛。

Siu Hung waak jo yat go sai man jai, sap fan ho oi.

Siu Hung drew a child, 0 very lovely.

(Question: Who was very lovely?)

I - Fig.15

1

Mei Mei huale yige xiaoxiannu, 0 shifen gaoxing.

美美畫了一個小仙女，十分高興。

Mei Mei waak jo yat go siu sin neui, sap fan gou hing.

Mimi drew a little fairy, 0 very happy.

(Question: Who was very happy?)

2

Xiao Guang huale yige xiaofeixia, 0 shifen gaoxing.

小光畫了一個小飛俠，十分高興。

Siu Gwong waak jo yat go siu fei hap, sap fan gou hing.

Siu Kwong drew a Peter Pan, 0 very happy.

(Question: Who was very happy?)

3

Didi huale yige chaoren, 0 shifen manyi.

弟弟畫了一個超人，十分滿意。

Dai Dai waak jo yat go chiu yan, sap fan mun yi.

My younger brother drew a superman, 0 very satisfied.

(Question: Who was very satisfied?)

Pronoun-Group Anaphora

I - Fig.3

1

Xiao Hong jiandao Xiao Li, 0 bian wen laoshi ta keyi bu keyi dao yinyueshi qu.

小紅見到小麗，便問老師她可以不可以到音樂室去。

Siu Hung gin dou Siu Lai, jau man sin saang keui ho m ho yi dou yam ngok sat.

Siu Hung saw Siu Lai, 0 then asked the teacher whether she could go to the music room.

(Question: Who asked the teacher?)

2

Mei Mei jiandao Zhen Ni, 0 bian wen laoshi ta keyi bu keyi dao caochangshang qu.

美美見到珍妮，便問老師她可以不可以到操場上去。

Mei Mei gin dou Jan Nei, jau man sin saang keui ho m ho yi dou chou cheung heui.

Mimi saw Jenny, 0 then asked the teacher whether she could go to the playground.

(Question: Who asked the teacher?)

3

De Ming jiandao Zhi Qiang shi, 0 bian wen banzhuren ta keyi bu keyi dao litang qu.

德明見到志強，便問班主任他可以不可以到禮堂去。

Dak Ming gin dou Ji Keung, jau man baan jyu yam keui ho m ho yi dou lai tong.

Tak Ming saw Chi Keung, 0 then asked the form teacher whether he could go to the hall.

(Question: Who asked the form teacher?)

K - Fig.4

1

Bi De jiandao Guo Qiang, 0 bian wen laoshi ta keyi bu keyi dao caochangshang qu.

彼德見到國強，便問老師他可以不可以到操場上去。

Bei Dak gin dou Gwok Keung, jau man sin saang keui ho m ho yi heui chou cheung.

Peter saw Kwok Keung, 0 then asked the teacher whether he could go to the playground.

(Question: Who wanted to go to the playground?)

2

Xiao Hui jiandao Xiao Mei, 0 bian wen banzhuren ta keyi bu keyi dao litang qu.

小惠見到小美，便問班主任她可以不可以到禮堂去。

Siu Wai gin dou Siu Mei, jau man baan jyu yam keui ho m ho yi heui lai tong.

Siu Wai saw Siu Mei, 0 then asked the teacher whether she could go to the hall.

(Question: Who wanted to go to the hall?)

3

Zhen Ni jiandao Xiao Hong, 0 bian wen laoshi ta keyi bu keyi dao yinyueshi qu.

珍妮見到小紅，便問老師她可以不可以到音樂室去。

Jan Nei gin dou Siu Hung, jau man sin saang keui ho m ho yi dou yam ngok sat.

Jenny saw Siu Hung, 0 then asked the teacher whether she could go to the music room.

(Question: Who wanted to go to the music room?)

L - Fig.7

1

Zhen Ni jiandao Mei Mei wen laoshi, ta keyi bu keyi dao laozuoshi qu.

珍妮見到美美問老師，她可以不可以到勞作室去。

Jan Nei gin dou Mei Mei man lou si, keui ho m ho yi dou lou jok sat heui.

Jenny saw Mimi ask the teacher, whether she could go to the art room.

(Question: Who asked the teacher?)

2

Xiao Ming jiandao Xiao Qiang wen laoshi, ta keyi bu keyi dao yinyueshi qu.

小明見到小強問老師，他可以不可以到音樂室去。

Siu Ming gin dou Siu Keung man lou si, keui ho m ho yi dou yam ngok sat heui.

Siu Ming saw Siu Keung ask the teacher, whether he could go to the music room.

(Question: Who asked the teacher?)

3

Bi De jiandao Zhi Ming wen laoshi, ta keyi bu keyi dao caochangshang qu.

彼德見到志明問老師，他可以不可以到操場上去。

Bei Dak gin dou Ji Ming man lou si, keui ho m ho yi dou chou cheung heui.

Peter saw Chi Ming ask the teacher, whether he could go to the playground.

(Question: Who asked the teacher?)

M - Fig.8

1

Xiao Qiang jiandao Xiao Ming wen laoshi, ta keyi bu keyi dao caochangshang qu.

小強見到小明問老師，他可以不可以到操場上去。

Siu Keung gin dou Siu Ming man lou si, keui ho m ho yi dou chou cheung heui.

Siu Keung saw Siu Ming ask the teacher, whether he could go to the playground.

(Question: Who wanted to go to the playground?)

2

Zhi Wen jiandao Bi De wen laoshi, ta keyi bu keyi dao laozuoshi qu.

志文見到彼德問老師，他可以不可以到勞作室去。

Ji Man gin dou Bei Dak man lou si, keui ho m ho yi dou lou jok sat heui.

Chi Man saw Peter ask the teacher, whether he could go to the art room.

(Question: Who wanted to go to the art room?)

3

Xiao Li jiandao Xiao Zhen wen laoshi, ta keyi bu keyi dao yinyueshi qu.

小麗見到小珍問老師，她可以不可以到音樂室去。

Siu Lai gin dou Siu Jan man lou si, keui ho m ho yi dou yam ngok sat heui.

Siu Lai saw Siu Jan ask the teacher, whether she could go to the music room.

(Question: Who wanted to go to the music room?)

N - Fig.12

1

Xiao Hua dale Xiao Qiang liangxia, ta bian jimangde zoukai le.

小華打了小強兩下，他便急忙走開了。

Siu Wa da jo Siu Keung leung ha, keui jau gap mong gam jau hoi la.

Siu Wah hit Siu Keung twice. He immediately went away.

(Question: Who immediately went away?)

2

Xiao Hong xiang Xiao Li ban ge guilian, ta bian lianmang zoukai le.

小紅向小麗扮個鬼臉，她便連忙走開了。

Siu Hung heung Siu Lai baan go gwai lim, keui bin lin mong jau hoi heui.

Siu Hung made grimaces to Siu Lai. She immediately went away.

(Question: Who immediately went away?)

3

De Ming paile Guo Qiang yixia, ta bian lianmang zoukai le.

德明拍了國強一下，他便連忙走開了。

Dak Ming paak jo Gwok Keung yat ha, keui bin lin mong jau hoi heui.

Tak Ming gave Kok Keung a tap. He immediately went away.

(Question: Who immediately went away?)

O - Fig.14

1

Tiyuke shangwan le.
Xiao Mei wangzhe Xiao Hong, ta hai mei you huan hao yifu.

體育課上完了。小美望著小紅，她還沒有換好衣服。

Tai yuk tong seung yun lak.
Siu Mei mong jyu Siu Hung, keui jung mei wun hou yi fuk.

The gymnastics class was over.
Siu Mei looked at Siu Hung. She had not changed her clothes yet.

(Question: Who had not changed yet?)

2

Xiake le.
Zhi Qiang wangzhe Bi De, ta hai meiyou ba shubao shoushi hao.

下課了。志強望著彼德，他還沒有把書包收拾好。

Lok tong lak.
Ji Keung mong jyu Bei Dak, keui jung mei jeung syu baau sau sap hou.

The class was over.
Chi Keung looked at Peter. He had not packed the schoolbag yet.

(Question: Who had not packed the schoolbag yet?)

3

Xianzai xiazheyu.
Zhen Ni wangzhe Mei Mei, ta hai meiyou ba yusan nachulai.

現在下著雨。珍妮望著美美，她還沒有把雨傘拿出來。

Yi ga lok gan yu.
Jan Nei mong jyu Mei Mei, keui jung mei jeung ba je lo cheut lei.

It is raining now.
Jenny looks at Mimi. She has not taken out an umbrella yet.

(Question: Who has not taken out an umbrella yet?)

4

Baba baozhe yige xiaohaizi, ta liekaiju xiao.

爸爸抱著一個小孩子，他咧開嘴笑。

Ba ba pou jyu yat go sai man jai, keui lit hoi jeui siu.

Daddy was holding a child. He grinned.

(Question: Who grinned?)

5

Xiao Ming kandao Xiao Qiang, ta hen jinghuangde paokai qu.

小明看到小強，他很驚慌地跑開去。

Siu Ming tai dou Siu Keung, keui hou ging fong gam pau hoi heui.

Siu Ming saw Siu Keung. He ran away fearfully.

(Question: Who ran away fearfully?)

6

Bi De zai maxituan kanjian xiaochou, ta liekaiju xiao.

彼德在馬戲團看見小丑，他咧開嘴笑。

Bei Dak hai ma hei tyun tai gin siu chau, keui lit hoi jeui siu.

Peter saw a clown in the circus. He grinned.

(Question: Who grinned?)

P - Fig.16

1

Di Di kanjian Zhen Ni shi, ta zhengzai chi tongxi.

弟弟看見珍妮時，他正在吃東西。

Dai Dai tai gin Jan Nei ge si hau, keui jing joi sik ye.

At the time brother saw Jenny, he was eating.

(Question: Who was eating?)

2

De Ming kanjian Mei Mei shi, ta zhengzai ting yinyue.

德明看見美美時，他正在聽音樂。

Dak Ming tai gin Mei Mei ge si hau, keui jing joi teng yam ngok.

At the time Tak Ming saw Mimi, he was listening to music.

(Question: Who was listening to music?)

3

Zhen Ni kanjian Bi De Shi, ta zhengzai shai taiyang.

珍妮看見彼德時，他正在曬太陽。

Jan Nei tai gin Bei Dak ge si hau, keui jing joi saai taai yeung.

At the time Jenny saw Peter, she was basking.

(Question: Who was basking?)

Q - Fig.17

1

Zhen Ni kanjian didi shi, ta zhengzai wenxi gongke.

珍妮看見弟弟時，他正在溫習功課。

Jan Nei tai gin dai dai ge si hau, keui jing joi wan jaap gung fo.

At the time Jenny saw brother, he was studying.

(Question: Who was studying?)

2

Biao Ge kanjian Zhen Ni shi, ta zhengzai chi xuegao.

表哥看見珍妮時，她正在吃雪糕。

Biw Go tai gin Jan Nei ge si hau, keui jing joi sik syut gou.

At the time male cousin saw Jenny, she was eating ice-cream.

(Question: Who was eating ice-cream?)

3

Zhi Ming kanjian Xiao Mei shi, ta zhengzai sanbu.

志明看見小美時，她正在散步。

Ji Ming tai gin Siu Mei ge si hau, keui jing joi saan bou.

At the time Chi Ming saw Siu Mei, she was taking a walk.

(Question: Who was taking a walk?)

《粵語兒童對照應關係的理解》

本文研究下列幾個問題：

(一) 兒童怎樣理解受結構制約的照應關係(先行詞跟照應詞處於同一句子中)。

(二) 兒童怎樣理解受功能制約的照應關係(先行詞跟照應詞分別處於不同的句子)。

(三) 他們理解不顯露的名詞主語和理解代名詞主語有沒有不同。

(四) 聆聽和閱讀照應關係的理解有沒有不同。

(五) 兒童會不會留意代名詞在書寫時的特徵。

實驗中有128位說粵語的學童和成年人(小學二年級，四年級和六年級的學童各32人，成年人32人)被隨機分成兩組，聆聽或閱讀30個含有零形照應關係的句子。另有128位受試者，其組合跟「零形組」相同，亦被隨機分成兩小組，聆聽或閱讀27個含有代詞照應關係的句子。此組爲「代詞組」。

測驗項目方面，「零形組」的句子裡，照應詞是零形名詞，作主語。「代詞組」句子的照應詞是代詞主語。句子有簡單結構和複雜結構的。

測試結果顯示：

(一) 句子的複雜結構以及先行詞和照應詞的表面距離，可以影響學童理解受結構制約的照應關係。

(二) 兒童會利用對主題和語義的知識，去理解受功能制約的照應關係。

(三) 兒童理解代詞照應關係比理解零形照應關係爲困難。

(四) 聆聽較閱讀稍爲容易。

(五) 兒童不去利用代詞書寫特徵去理解閱讀時所出現的代詞照應關係。

《國王與我——古漢字結構成份及其導發因素分析舉隅》*

法國科學院　　游順釗

分析古漢字的結構成份是研究古漢字字源的一個重要步驟。但我們不能停留在這階段，還得追溯這些成份後面的導發因素（motivating factors）。

傳統上的六書，為首的那兩個做字原則——象形和指事——是最接近古漢字草創階段的。從象形和指事角度看，有些古漢字的結構成份和導發因素是顯而易見的。比方古漢字裡的“休”，“上”和“下”等字。另有好一些古漢字，雖然較為棘手，經過學者的研究都得到合理的解釋。可是還有不少蘊藏著語言和文化資料的古漢字仍有待我們去發掘。

試舉  或（名）字為例。唐蘭（1981）曾說過這個字表示一個人在晚上說話。但他沒有進一步說明為甚麼“名”這個概念由“晚上”和“嘴巴”這兩個成份來表達。

由於和聾人接觸，我從他們的手語得到些啓發。手語是視覺語言，得在光線下進行，在黑暗裡就難以應用了。“名”字，許愼說它的意思是“自命”。我認為那就是說“自名”。用“命”而不用“名”是為了避用同字互釋而已。按許愼的解說，“名”和古漢字“自”組成一個“手勢—言語”相對體（gesturo-vocal dichotomy）。“自”是“鼻”字的前身。古漢字的“自”兼指“自己”和“鼻子”。這和中國人用指著鼻子這個手勢來表示“自己”

Lee, T. (ed.) 1992, *Research on Chinese Linguistics in Hong Kong*, pp. 161 - 176. Hong Kong: The Linguistic Society of Hong Kong.

那個習慣是一致的。（在西方，一般是以手尖點點胸部）。這個傳統手勢就是創造“自”字的導發因素。“名”和“自”這個相對體暗示在白天裡，以指著鼻子來表示“我”，一如有人敲門，你問“誰呀？”回答：“我”一樣。在晚上光線不足的時候就得把“我”字說出來了。由於年代久遠，文獻不足，往往使古漢字研究工作者難獲得共識。我以為與其說誰對，誰不對，倒不如比較哪個解釋方案更合理，更有意思，更能說服人。那就是說我們最好有個標準去衡量各家的說法。比方  或  （女），有人說這個字，描的是一個雙手放在身前的女子形象。這個觀察對或不對是很難斷定的，因為在平面上是沒法看出來的。但我卻認為“女”字那雙手是放在身右旁的。首先，在甲文帶“女”的441個字中，有68.5%“雙手”是指向右方的，金文中461個則有86%是指向右方的。這個指向和漢代以前及漢代間男左女右這個傳統不無關連（黃1985）。但更重要的是一些明代刻本插圖（見附圖一）以及崑劇女旦在行禮時雙手是扣在身右旁這些實證。藉著這些資料，本來是平面的也可以看出個頭緒來。雖然一時仍未能下定論，但多些論據總比沒有的更有意思，更有說服力。關於古漢字的研究，雖已有好些未成文的標準，我仍想補充一兩條，作為各家解釋方案的衡量標準：多角度的引證，即引用多方面，甚至表面上看來性質不大相同的或地域有異的資料；解釋方案的結論具有語言學或民族語言學(ethnolinguistics)的意味，在遍性(universals)或地域性(regional significance)方面有特殊的旨趣和新意。我補充這兩條的原因是希望古文字學能走出傳統的研究範圍，

開拓出去。當然，這不是靠胡扯，而是要運用更大的聯想和概括力。要使古漢字研究不單止為校讀古文獻服務，還要進而為語言學，以至人類語言學提供新的數據。

關於古漢字研究如何跟普通語言學結合，特別是語法方面的結合，可參看前些時刊登的拙著（游1983; 1988），這裡不再贅述了。現在提出另一個古漢字  “恥”字作為對古漢字研究開拓的一個說明。很奇怪的，許慎不把“恥”字放在“耳”部而排在“心”部。他準是以“恥”是一種心理狀態而把它放到心部去。但我同時亦認為這也是因為他沒弄清楚“恥”字的字源，所以才作出這個決定。按我的分析，“恥”字背後的導發因素是我們今天仍沿用著的一個傳統手勢。

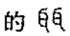
在廣東粵語區，當小孩們做錯了事，特別是說謊而又給人家識破時，大人們會邊打著一個手勢，邊唸著個順口溜：“醜，醜，醜，醜甩耳仔送燒酒”(醜=沒羞；甩=掉了；耳仔=耳朵；送燒酒=下酒)。而這個動作，粵人的打法是用食指指尖在自己耳根後面往前撥幾下。在北京一帶，這個動作是打在自己臉頰上。一邊打，一邊向對方說著“沒羞，沒羞”。在山西、湖南和上海一帶，雖然手勢也是打在臉頰上，動作方向是向下拉。具有相近意思的類似手勢，在中國的鄰近地區也可以觀察到。漢城的和北京的打法很接近，只是用的不是食指而是拇指。據說日本的手勢是用食指或拇指指尖輕輕敲著鼓起的臉頰，但有些日本朋友則說從來沒見過這個手勢。無論一般日本人用或不用這個手勢，反正在日本聾人手語裡是存在的。在越南胡志明市(前西貢)和印

尼耶加達的手勢則近似上海的程式。由於這些手勢都散佈在有華僑聚居的地方，也許這些手勢是從中國傳播出去的。順便提一提的是歐美非三洲都沒有發現類似的手勢。

那麼這個打在臉頰上的手勢和“臉紅”這個生理現象有沒有關係呢？那就是說，手勢打在臉頰上是否在戲弄或取笑對方“臉紅”呢？這個以生理作依據的探索也是值得注意的。有時候隨著這個方向，會發現一些有趣的語言心理現象。比方當我們說一句較為明顯的反詰句時，我們的眉心部份就會往上輕輕地抽動。在轉回去談“恥”字問題前，得指出，“臉紅”雖然是個遍性的生理現象，若在膚色較深的人的臉上是看不出來的。在這情況下，譬如非洲的語言就沒有用“臉紅”那樣的形像描述去表達那種“羞愧”的感覺。

我認為上述那些手勢，特別是粵人所用的那個程式，就是“恥”字背後的導發因素。再進一步說，這些手勢本身的導發因素是社會性的而不是生理性的。

從手語的演變規律，我們可以推論出打在耳根後面的是這個手勢的老式（即粵人的手勢），而其他地方的手勢都是這個老式的變體。手勢位置的演變規律是朝“對話”人的視覺焦點慢慢靠攏而不是向旁遷移的。這就是說，從歷史語言角度看，要是一個手勢的位置發生變化的話，它是由打手勢人的身旁向前面的正中空間移去而不會從面前正中空間往身旁外移的（參見 Woodward 1976）。我們是根據這個規律來論證這個手勢是從耳根附近移向臉頰的。現在要問的是為甚麼這個手勢打在耳朵上。許慎認為

“恥”字得聲於“耳”是很值得注意的，雖然他只指出其然而未說明其所以然。我是根據這個線索去假設“恥”和“耳”是同源字。它和“耳”的同音字“刵”都是從“耳”字派生出來的。據《書·呂刑》“刵”是古代五刑之一，是個相對地來說較輕的刑罰，比如以言犯上的人，就會被處刵刑，耳朵給割掉。這個手勢的原來意思，在我看來，是告誡對方“小心你的耳朵”，警誡那些在言辭上不慎的人。後來這意思弱化了，變成今天用在取笑小孩或玩耍的場合裡。語義的弱化是個普遍的現象，稍為留意一下日常的粗語就能體會到這弱化進展之速。我這個解釋還有一個旁證。在山東和上海附近的崇明島有一個與“恥”字手勢意思相類似的動作。那裡的人們朝著對方，用彎作勾形的食指沿著自己鼻樑往下來回刮幾下。南京也如是。南京人還邊打邊說著“不要鼻子，不要鼻子”，代替北京人的“沒羞，沒羞”和粵人的“醜，醜，醜...”。和“恥”字手勢合起來看，這個“刮鼻子”動作顯然是古代模仿“割鼻子”刑罰的動作。劓是古代五刑之一，和刵都是五刑中較輕的一個，也許比刵重些。這些地區的人打著手勢時說的“不要鼻子”可以理解為“小心你的鼻子”，一如粵人撥著耳根時說的“小心你的耳朵”。至於為甚麼古漢字終以“耳”字而不以“鼻”字作為代表“恥”這個概念的字根或詞根，那是漢語內部詞的取捨問題，既超越本題，也是我們沒法商討的。關於“恥”字，總的來說，它的導發因素是個刑例，是社會性的，與生理（臉紅）無關。循著這個假設，我們還可以解釋另一個古漢字的字源。《說文》裡的  （聑），許慎只說

是“安也”，卻沒有說明為甚麼“安”這個概念由兩個耳朵來表達。但假如犯罪會給人家割掉耳朵，那麼兩個耳朵都安然無恙，總算是平安大吉的。許慎這回，既然不能說從甚麼得聲，只好甚麼也不說了。這也表示他做學問審慎之處。

把手勢和古漢字相提並論是意味著我們從古文字靜態分析過渡到動態分析。這角度上的轉移，好些時候能幫助我們看清楚某些古漢字背後的導發因素。上文提到的“自”字就是個很好的例子。

除了手勢和體態外，一些器物也會成為古漢字的導發因素。由於時代古遠和古漢字結構成份形象已高度簡化，使原來的對照物難於辨認，更往往使人產生誤解。現試以“朕”字為例。“朕”字甲文作  或  。《說文》作，並釋為“我也”。在文獻上，“朕”是皇帝的自稱，相等於英文的"royal we"。然而《說文解字注》則妄作修補，說甚麼“舟縫”等等(因朕兆，卜兆而聯想到裂痕)。近人如羅振玉，郭沫若也沒能對這個字源提出合理的解答，這也完全因為他們囿於以"朕兆"為"朕"的第一義這個執著。但"朕"字在甲文裡第一義是帝王的自稱。我以為，從  ，  ，(後人更誤隸定作“月”)這個結構成份在“朕”字裡位置的變動性已可知它是注音符號的可能性是很高的了。但更重要的是“朕”字主體裡那結構成份。那雙手拿著的是甚麼呢？那件物體和帝王自稱又有甚麼關係呢？在參攷其他文化區域文字風俗記載後，我猜想這件物體當是根權杖無疑。古埃及文字就是以一根木棒  來表示“陛下”的。而所有派生出來的“陛下你”，“陛下他”以至和“朕”一樣的皇帝自稱也是以木棒為其字

根(參看 Gardiner 1957)。此外還有一個佐證。1973 年間在太平洋玻里尼西亞群島有個離群的舜人叫 Kagobai。他自創的二百多個手勢裡，有表示“酋長”的一個手式：雙手平疊放在胸部和脖子間，手心向下。這動作其實是雙手按著一根木棒——酋長的權力標誌(見附圖二，並參見 Kuschel 1974)。在離該群島三千多英里的另一個島嶼上發現的木彫，也同樣的以雙手拿著木棒作為權力標誌(見附圖三)。因此，我推測“朕”字那一豎筆是代表一根木棒或一根權杖大概不會錯。那麼，許慎也沒有錯，只是沒說明而已，像後世人所說的“待詳”，做到他名乎其實的“慎”。與此相反，千多年後的《說文解字注》卻胡說甚麼舟縫，那簡直是風馬牛之談。對“朕”字這個懸案，我就作這個補釋。

談完皇帝，來談談與皇后的那個“婦”字。按《甲骨文編》，把所有甲文的  ，  同字異形體都隸定作婦字。比如頭一條說：“  甲六六八帚用為婦，婦好”。把這個字隸定為“帚”，某一程度上使人感覺到是受《說文》的影響。雖然《甲骨文編》這個處理不一定要對傳統的，特別是自《說文》後對“婦”字的貶義性的分析分擔責任，但起碼它沒有起一個澄清的作用。這就是說《甲骨文編》編者們沒有注意到是個甚麼符號，代表甚麼物體。隸定作“帚”，那就是讓讀者把它理解成“掃帚”。《說文》就這樣說：“婦，服也。從女持帚。灑埽也”。自此，兩千年來卻沒有人為這個字翻案，也就是為婦女這個受委屈形象翻案。中國婦女地位低賤這是事實，但把“婦”字作為文獻上的根據，那真的要為“婦”字鳴冤了。其實，自 1976 年發掘所

謂“婦好墓”後，得到的一批新材料，使我們對這個“婦”字該有新的認識。試看墓裡帶有“婦好”符號的文物。我認為所謂“婦好”兩字有兩個特點：第一，這個隸作“帚”的成份，絕大多數是明顯地在其他成份之上，給人有些懸掛著的感覺；第二，基本上不成行，不像是有文字的順序排列。另一方面，我們知道同時出土的還有刻著“司母辛”和“司  母”的銅器。據《殷虛婦好墓》，“婦好”組是墓主生前自作之器，那就暗示說“婦好”是墓主生前自用的名字。鑄有“司母辛”，“司辛”則是某些王室成員為墓主所作的祭器，那就是說“司母辛”等是宮中人對墓主生前的稱呼；第三，“司母”組則是墓主母族為她作的祭器。那就是說“司母”是她娘家對她的稱呼。（此外還有別的稱謂，詳見該書。）從字形和字的分佈看，“司辛”，“司母辛”，“司母”，才較像有字的順序排列，而“婦好”卻沒有，因此我懷疑“婦好”不能這樣隸定。

我的懷疑漸漸轉向這個符號上。看來不像是掃帚，更不是小篆里的那樣：上面是隻手，掃帚尖向地。要是真的是掃帚的“帚”，怎會老是朝天的呢？(掃帚朝天是個禁忌，對粵人尤以為然)。當我看到埃及皇宮的圖畫後才有所悟(見附圖四)。這個，我深信就是一種flabella，像我們舞台上的宮扇，（是用雉雞尾作，參見杜甫《秋興》）。為皇后妃嬪出場時，隨後的兩個宮女持著那兩把長柄的宮扇，在那貴人的頭頂後面交叉舉著。而古埃及則是用鴕鳥羽毛作的，但持扇的人可以是男也可以是女。這樣推論下去，所謂“婦好”兩字，很可能是個徽號，上面刻著的表示主人的身份，養有太子的皇后或妃嬪。那符號

既不是現在解作掃帚的帚，也不是和（女）字合體念成“婦”字，，也不是和另一“女”字合體念作“好”（見附圖五甲、乙）。當然仍可以隸定作“帚”，但意思應指“宮扇”一類東西而不是“掃帚”。這有點像英語 carpet 一詞。現在一般譯作“地毯”。按《牛津大辭典》，十四世紀中葉時仍是用來鋪桌子或蓋床的。一百年以後，即十五世紀中葉，才鋪到地上去讓人踩踏的。就算“帚”字後來和“女”字合體，這也並不是說婦人“執大掃”。(粵語“掃”與“數”，即賬目，同音。“執大掃”為諷刺語)。這個“婦”字社會語義的貶值，一如法語的 Madame，Monsieur 一樣，原是稱呼高貴人家，現在已變成可以用來稱呼不認識的一般婦人或男子了。

結束前，想多說幾句題外話。今天在母校講古漢字，使我想起卅年前學生時代寫英語字源學習作時的情景。當時我的老師是格林青教授 (Professor Alan W. T. Green)。我並不是個勤學生，但第一次碰上這個課題就給它迷著了。這可見古文字學的魅力，中外一樣。它很容易使你廢寢忘餐或忘卻外間的一切。近世紀來，中國正處於內憂外患之際，所以一些有識之士，受不了外間的壓力，都以此為避世之所。例如，一些有關王國維的資料和郭沫若在日本寫的一個後記，都顯示出這兩位一代學人，在學有所成情況下的一種內疚心態。郭氏在那個後記裡有這樣的幾句話：“亡命生活又是十年...我開始了古代社會的研究。為了研究的徹底，我更把我無從發洩的精力用在《殷墟甲骨文字》和《殷周青銅器銘文》的探討上面....我的從事古代學術的研究工作，事實上是娛情聊勝無的事。假如有更多的實際工

作給我做，我倒也並不甘心做一個舊書本子裡的蠹魚。然而時代畢竟善於調侃...”。（郭1950）古文字學本來是，也應該是盛世之學。只是在近百年內，特別最近的二三十年，竟成為一枝獨秀的學科，作為這行業的一員不能不有所深思。

* 本文是一九九一年二月五日在香港大學亞洲研究中心宣讀的演講稿。香港大學語言中心葉孔修女士繪制附圖。謹此致謝。

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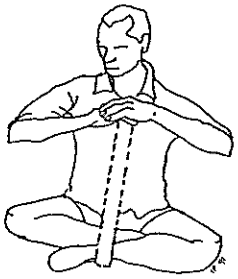
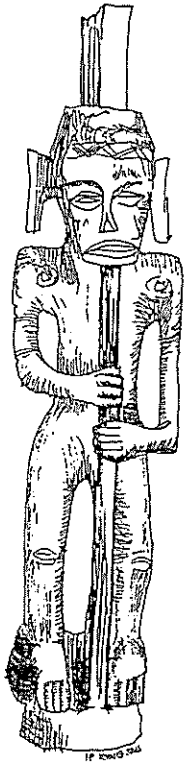
附圖一：明刻本《玉簪記》“合家重會”插圖



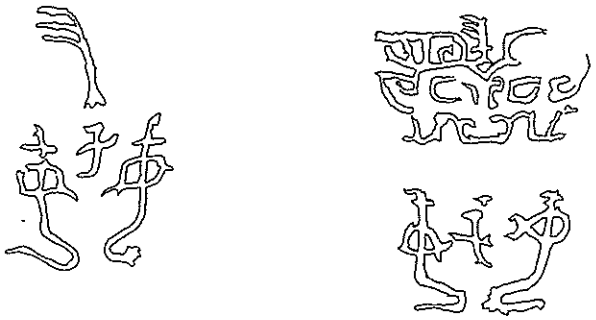
附圖二：按 Kuschel (1974) 照片描畫



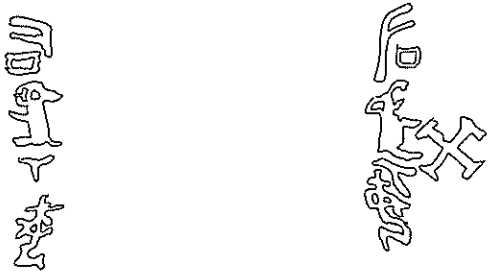
附圖三： 照 Anthropomorphic sculptures. From the Admiralty Islands. Musee de l'Homme, Paris. 描畫。參見 Ambesi 1966。

本圖是按 Erman 和 Ranke (1963) 描畫。

附圖四：本圖是按 National Geographic Magazine November 1990, No. 5, Vol. 178, pp. 104-5 作部份描畫



附圖五(甲)：上列兩附圖是按《殷墟婦好墓》婦好組銅器銘文拓片描摹的。



附圖五(乙)：上列兩附圖是按《殷墟婦好墓》司㠯母組銅器銘文拓片描摹的。

The King & I – Artifacts as Motivating Factors in the Formation of Chinese Archaic Ideographs

YAU Shun-chiu
CNRS, France 1992

In a previous study (Yau 1991), it is shown that conventional gestures play a significant role in the creation of Chinese archaic ideographs. The aim of this article is to illustrate how the graphical representations of artifacts served as object referents in various characters. The identification of an artifact in an ideograph (or pictograph) can be extremely difficult if the artifact has long become obsolete, or if its graphic image in the script has been subject to serious morphological simplification, distortion or erosion. In such cases, misinterpretations and wild guesses flourish and consequently, controversies are inevitable. I discuss here two examples which have eluded the analysis of Chinese paleographers for the past two thousand years.

Tough Movement in Chinese/English Interlanguage: Contrastive Analysis and Learnability[1]

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1. Introduction

The English structure known as "Tough Movement" (TM) has proved to be a perennial puzzle for linguists; it also poses considerable difficulty in second language acquisition. This paper follows the development of the structure in the interlanguage of Chinese ESL speakers, highlighting the contrast between Chinese and English grammar in the treatment of "tough" predicates. The developmental phenomenon in question provides a revealing example of the complexity of interlanguage syntax. We trace the problem back to its roots both in Universal Grammar and in specific contrasts between English and Chinese. The interlanguage constructions are analysed in terms of Government and Binding theory as a case of Subject Raising, erroneously generalised to "tough" predicates. Further, studies in the acquisition and typology of complementation converge on the conclusion that the target English TM is an exceptional structure, which is acquired late in L1 and with great difficulty in L2 acquisition.

We then formulate the acquisition problem in terms of learnability theory, specifically, the Subset Principle. Like the case of ergative verbs (Yip 1990), the interlanguage construction here involves over-passivization, which in this case interacts with the interlanguage Raising Structure. Acquisition of the target TM structure requires a radical reanalysis which entails reducing the scope of both Raising and of passivisation. A possible solution to the learnability problem is shown to involve the interaction of syntax and semantics.

1.1 Tough Movement in English

English sentences such as (1) and (2) have long attracted the interest of syntacticians. They have come to be known as "Tough Movement" structures.[2]

(1) John is easy to please.
(2) This book is hard to read.

Since Chomsky (1965) identified these sentences as problematic by contrasting them with the superficially similar complement structure *John is eager to please*, they have invited many different analyses over the course of development of grammatical theory; indeed, their analysis continues to present a challenge.

Lee, T. (ed.) 1992, *Research on Chinese Linguistics in Hong Kong*, pp. 177 - 191. Hong Kong: The Linguistic Society of Hong Kong.

In the acquisition arena, equally, the TM structure proves to present a special challenge to learners, both for children learning English as L1 and for L2 speakers of different native languages. This study investigates the particular problems posed to Chinese speakers by the acquisition of TM and related structures.

1.2 "Pseudo-Tough Movement" in Chinese/English Interlanguage

We will term the interlanguage (IL) construction at issue "pseudo-Tough Movement," by analogy with "pseudo-passive," "pseudo-relative, etc. Here, to begin with, are some anecdotal examples. One of our Chinese subjects remarked:

(3) I am very easy to forget.

Context revealed that this was not meant to be an expression of Chinese modesty, as it would have to be interpreted in native English. The intended meaning was: "I forget [grammar] very easily." Another student complained,

(4) I am boring to study.

The student's complaint was not that it was boring to study him--indeed, we hope to show the converse--but rather that it was boring for him to study. The error repeats itself with other so-called "tough" predicates, as illustrated in (5)-(8):

(5) They [Asian Americans] are not easy to be managers.
(6) Everything is possible to happen.
(7) I will concentrate my interest in the programming of supercomputers, which is still difficult to become efficient.
(8) I am not convenient to come to school this week.

At first blush, what Chinese learners appear to be doing is consistently misapplying English TM to subjects rather than objects of complement clauses. Schachter and Celce-Murcia (1977) note one such example from a Japanese speaker in discussing the pitfalls of error analysis:

(9) Americans are easy to get guns.

They warn that while the structure appears to be based on TM, it may have a more complex source in Subject Raising structures.

That the problem indeed involves more than over-generalization of TM can be seen from the treatment of underlying objects--that is, those structures which *should* be subjected to TM in English. Instead of doing so, Chinese ESL speakers consistently passivize the dependent verb:

(10) Communications tools are difficult to be commercialized.
(11) The instrument is easy to be performed.

If the IL structure were indeed modelled on TM, then we would expect to see at least some cases of correct usage, as in:

(10a) Communications tools are difficult to commercialize.
(11a) The instrument is easy to perform [on].

Such examples, however, are conspicuously absent from our production sample. The absence of the genuine TM counterparts in the contexts where they are expected calls into question the *prima facie* analysis whereby examples (3-9) involve TM. What the passivization of these examples shows, we will suggest, is assimilation of "tough" predicates to an across-the-board Subject Raising strategy. To motivate this analysis, however, will require a contrastive analysis of the relevant structures in Chinese and English.

2. Contrastive Analysis

The superficial similarities between the English and Chinese "tough" structures turn out to be misleading. To reveal the underlying structures requires examination of the properties of the respective constructions and the logic of possible derivations.

2.1 Raising and "Pseudo-Tough Movement" in Chinese

Possible sources for the IL structures in Chinese grammar include superficial counterparts of both "pseudo" and "real" tough movement, as in (12) and (13) respectively:

(12) Ta hen nan zhaodao fangzi.
He very difficult find room
'It's difficult for him/her to find a room.'
(13) Fangzi hen nan zhaodao.
Room very difficult find
'Rooms are hard to find.'

Because of the surface similarity, certain sentences can be ambiguous as between subject and object readings:

(14) Ta bu rongyi wangji.
S/he not easy forget
'S/he does not forget easily.'
or 'S/he is not easy to forget.'

However, the ambiguity is often removed by passivization, where the predicate allows it:

(15) Ta bu rongyi bei (ren) wangji.
S/he not easy PASS (by people) forget
'S/he is not easy to forget.'

That type (12) is an instance of Raising is argued both by Hou (1979) within Relational Grammar and by Li (1985) within Government and Binding theory. Under a standard formulation in Government-Binding theory, the derivation involves movement from the subject position of the complement clause to that of the matrix clause:

(12) Ta hen nan [t] zhao dao fangzi
¦_____¦

The intuition behind this analysis is that the phrase *ta hen nan* 'he is difficult' is uninterpretable in isolation: its surface subject *ta* 's/he' is the logical underlying subject of *zhaodao* 'find.' Raising is a case of NP-movement and hence shares a number of properties with passive.

The other structure, as in (13) which on the surface resembles TM, does not seem to have received much attention. Recently, however, both Shi (1988) and Comrie & Matthews (1990) have suggested that it is actually a case of topicalization. The empty subject could be expletive, as in other impersonal structures, or it could be a pronominal with arbitrary reference that has undergone Raising as in (12). The respective structures would be:

(13a) [Fangzi] [pro_{exp}] hen nan zhaodao [t]
¦_____¦
'As for rooms, it is difficult to find them.'

(13b) [Fangzi] [pro_{arb}] hen nan [t] zhaodao [t]
¦ ¦_____¦ ¦
¦_____¦
'As for rooms, one has difficulty finding them.'

The choice between these two analyses hinges on the nature of non-referential null subjects; this is a question which also arises for a variety of other Chinese structures, and we will not attempt to resolve it here. What is important from the learnability point of view is that the Chinese structure which superficially resembles TM is simply a special case of the much more general phenomenon of topicalization; whereas TM, as we shall see, is an exceptional construction both within English grammar and cross-linguistically. This contrast points the way to an account for our finding that TM is not produced by any but the most advanced Chinese learners of English.

One question that arises from the contrastive analysis given here is why learners at an early stage do not seem to transfer the structure (13), thereby forming a TM-like structure by accident, as it were. Given that Chinese speakers tolerate the ambiguity of sentences such as (14), they might be expected to use

pseudo-TM as an interlanguage counterpart to both (12) and (13). The fact that they do not, as noted in section 1.2, suggests that they somehow recognize that the NP in (12) is a subject and that in (13) is not. The lack of transfer of (13) would then be indicative of an awareness of the limited status of topicalization in English (see Yip 1989).

2.2 Raising and "Tough Movement" in English

As we have seen with respect to Chinese, the primary diagnostic of a Raising structure is that the surface subject is not a possible argument of the immediate predicate. Thus the verb *seem* in isolation cannot take a referential subject at all:

(16) *John seems. (cf. John seems to be sick.)

Raising adjectives such as *likely* cannot be used as main clause predicates (except elliptically):

(17) ?Tom is likely. (cf. Tom is likely to come.)

These contrasts, together with a number of syntactic properties, are taken to indicate that the surface subject of such predicates originates in the lower clause.

Tough Movement has been treated in some frameworks as a sub-type of Raising (e.g., in Relational Grammar: cf. Eckman 1977). However, Chomsky (1977) pointed out that TM shares more properties with Wh-Movement than with NP-Movement (as instantiated in Passive and Raising).[3] Under this analysis, it is not the noun phrase itself which is assumed to move (as in topicalization), but a null wh-phrase, subsequently termed an empty operator (Chomsky 1982):

(1a) John is easy Wh-Op [PRO to please t]
¦_____¦

Since the subject is generated in situ, the structure is radically different from the Chinese topicalization as in (13a) or (13b), despite the superficial resemblance.

2.3 "Pseudo-Tough Movement" as an Interlanguage Innovation

The conspicuous absence of genuine TM in Chinese learners' English production shows that the interlanguage construction does not represent overgeneration of TM. Moreover, TM is widely rejected as ungrammatical in judgment tasks (see section 3). TM, however, is not infrequent in the input, and presumably provides the surface form of "Pseudo-TM." The linear sequence is that of the target structure:

NP be Adj Infinitive

The underlying structure and its interpretation, however, are those of Subject Raising, as in (12) above. The application of Raising specifically to adjectives of the "tough" class can be attributed to the influence of Chinese. This phenomenon can be phrased in terms of Schachter's (1983) approach to transfer as a constraint on L2 hypothesis formation: on this view, the role of the L1 construction is to suggest an erroneous Raising analysis of TM structures. This IL hypothesis may be strengthened by the instantiation of Raising in both verbs and adjectives in English, as in:

(18) The Princess appears to be happy.
(19) The Princess is likely to visit Hong Kong.

The generalization of Raising to tough predicates, then, has roots in both L1 and L2 instantiations of Raising. The productivity of IL creative construction is evident in the passivized variant which combines Raising and passivization. The derivation of a structure like (11) involves successive applications of NP-movement: the underlying object first moves to the subject position of the lower clause (a) and then undergoes Raising (an instance of NP-movement) to the subject position of the matrix clause (b):

(11) The instrument is easy t to be performed t.
(b) (a)

By subsuming all "tough" predicates under the same rule, this represents a maximally simple strategy. Under the Raising analysis, the passivized and the non-passivized versions of pseudo-TM structures are unified. Below, we discuss developmental and distributional evidence that Raising is also universally unmarked relative to TM.

3. Acquisition of Tough Movement in L1 and L2

Both first and second language acquisition studies have shown that English TM poses special difficulty. Carol Chomsky (1969) studied children's acquisition of complex English structures including TM. The results of her comprehension task showed that these structures are typically misinterpreted by young children, and are not fully acquired until the age of ten or even later. Given a pair of sentences such as (20) and (21) below, children do not discriminate between these two sentences which have different structures despite their superficial similarity:

(20) John is eager to see.
(21) John is easy to see.

Children routinely take (21) to mean "it is easy for John to see" rather than "it is easy for someone to see John."

Chomsky's methodology has since been adapted and extended in the investigation of adult L2 acquisition of similar structures. D'Anglejan and Tucker (1975) reported that French adult learners of English behaved like English-speaking children in misinterpreting the TM structures. Cooper et al. (1979) replicated the study with Egytian and Israeli adult learners of English and obtained similar findings--the errors of comprehension were analogous to those of children. For example, given (23):

(23) Ann is fun to visit.

these speakers misassigned the subject of the sentence as the subject of the complement verb. The TM structures proved to cause the most difficulty among the various complementation structures investigated. This finding has been replicated for Chinese speakers by Chiang & Costello (1983) and in a pilot study reported in Yip (1989), in which it was found that many ESL subjects rejected TM structures as ungrammatical in a judgment task.

In search of an explanation for these findings, researchers have looked for possible native language influences. The lack of TM structures in the L1 would account for the difficulties of Arabic and Hebrew speakers, but not French speakers: French has both "easy to see" and "eager to see" constructions, distinguished by the preposition preceding the complement verb:

(24) Le président est difficile à voir.
'The president is difficult to see.'
(25) Jean est heureux de partir.
'John is happy to leave.'

Despite the apparent advantage of French speakers, the error rates and types were similar for French, Arabic and Hebrew speakers.[4] Cooper et al. conclude that similarity of L1 and L2 structures does not appear to facilitate acquisition of such complex structures; learners seemed to be dealing directly with the L2 without mediation of the L1. They conclude that creative construction is as much a feature of second as of first language acquisition.

A study by Bongaerts (1983), however, found that Dutch schoolchildren had fewer problems with TM structures than did d'Anglejan & Tucker and Cooper & Tucker's subjects. He attributes this to the fact that Dutch speakers have already been confronted with similar surface structures for "easy to see/eager to see" constructions in their native language. The difficulty of English TM, on this account, lies in the absence of any overt distinction between it and other structures (such as Raising and Control) in which the matrix subject is also the complement subject.

What this acquisition research shows is that TM causes considerable difficulty for speakers of all L1s except for those with structures very similar to the target English construction. In the next section, we show that this difficulty finds a parallel in the cross-linguistic distribution of complementation structures, and explore some possible explanations.

3.1 Tough Movement and the Typology of Complementation

A further source of evidence for the exceptional nature of TM--beside the theoretical problems it poses and the acquisition data discussed above--comes from the typological study of complementation structures. Eckman (1977) proposed the following implicational typology of Raising structures:[5]

(i) Subject-to-Object: John knows himself to be brilliant.
(ii) Subject-to-Subject: John seems to be brilliant.
(iii) Object-to-Subject (TM): John is hard to believe.

Within Eckman's sample of languages, some (e.g. Semitic languages such as Arabic and Hebrew) have (i) only, some (e.g. Greek, Polish) have (i) and (ii) and others (English, several Romance languages) have all three types; any other combination is claimed to be impossible, in accordance with general principles of Relational Grammar. There may be counter-examples, but the implicational relationship between types (ii) and (iii) is what concerns us here.

To the extent that Eckman's implicational hierarchy is valid, it makes predictions for the order of acquisition. Hawkins (1987) argues that insofar as interlanguages are treated as natural languages, they must obey all implicational universals. Translating Eckman's typological statement into this system, an interlanguage should at no stage have Object-to-Subject Raising without also having Subject-to-Subject Raising. Given the order-of-acquisition prediction, we expect that learners cannot acquire Object-to-Subject Raising (TM) before they have acquired Subject-to-Subject Raising.

In fact, what the collective acquisition research suggests is that Subject-to-Subject Raising, once acquired, is regularly extended to the class of TM predicates. Learners typically expand the scope of Raising to cover TM structures, i.e., they misanalyze TM structures in terms of Subject-to-Subject Raising. Their problem then is to delimit the scope of Raising and acquire the target TM structures. We turn to these learnability problems in section 4.

Further circumstantial evidence that the IL TM-like structures might not involve genuine TM comes from Comrie & Matthews' (1990) typological study of the differential treatment of "tough" predicates across languages. They argue that what might appear to be instantiations of Tough Movement in German and Serbo-Croatian in fact have radically different structures.

In the light of this distributional evidence, English-style TM appears as the exception rather than the rule, a likely candidate for a marked structure. This is consistent with the difficulty caused by TM in both first and second language acquisition, and with the direction of interlanguage errors: by passivization as in (10-11), the complements of "tough" predicates are made to conform to the preferred type whereby the matrix subject is also the subject of the complement clause. Just why this should be preferred over TM invites speculation. Current work is focusing on the acquisition of null operators such as those instantiated in TM. Goodluck (1989) has studied the acquisition of purpose clauses such as the following, which are also analyzed as involving a null operator:

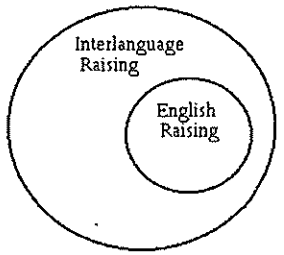
(26) They are looking for someone [Op] to visit [t].
|_____|

She found that children regularly misinterpreted such sentences in the same way as they do TM, i.e., as if *someone* is the subject of *visit*, the correct interpretation being acquired very late.[6] Ken Wexler (p.c.) observes that null operator constructions in general appear to be 'difficult to acquire.' Katada (1991) suggests as a reason the fact that null operators--unlike wh-words and quantifiers--have no features by which they can be identified.

The Raising structure that wins out over TM in both production and judgmental data has several factors in its favour: instantiation in both L1 and L2 on the one hand, and universal tendencies as reflected in cross-linguistic distribution on the other. These factors, we hypothesize, together lead to the overgeneralization of Raising to "tough" predicates in the interlanguage grammar.

4. Learnability

The over-extension of Raising presents a serious learnability problem which can be phrased in terms of the Subset Principle. As proposed in the first language acquisition literature (cf. Berwick & Weinberg 1984), the principle states that grammar is learnable from direct positive evidence insofar as acquisition proceeds from a subset to a superset. Its corollary, relevant to interlanguage contexts such as this, may be called the Superset Principle: grammar is in principle **not** learnable from positive evidence insofar as the learner begins with a grammar which generates a superset of the target structures. "Pseudo-TM" is a case in point: Raising in the interlanguage is a superset of that in English, in that it applies to many more predicates, including "tough" adjectives:



Given this scenario, there is no direct evidence in the English input to disconfirm the learner's hypothesis. Hence, we predict that the error will be a persistent one.

It has been suggested that such situations can be resolved by preemption of the over-generalized IL structure by the correct L2 form (see Yip 1989). Indeed, in the case of successful learners the Pseudo-TM structure is eventually replaced by its functional counterparts in English, viz.:

(27) I easily forget.
(28) I have difficulty learning.

These constructions pose different problems. The adverbial construction in (27) is monoclausal, unlike TM and Raising, and neither (27) nor (28) represents a fully productive type, not being generalizable across "tough" predicates:

(29) *I interestingly study computers.
(30) *I have ease to forget.

Another functional counterpart is the expletive construction, as in (31-32):

(31) It is interesting to study computers.
(32) It is easy to forget.

This alternative may help by disambiguating the TM and "Pseudo-TM" readings: indeed, some of our subjects informed us that they would prefer to use the equivalent structures with the expletive it with "tough" adjectives. Notice that the object stays next to the verb and no ambiguity arises. However, this is not an entirely satisfactory solution to the learnability problem since it does not allow referential NPs to appear as subjects.

The other task facing the learner is to reanalyze the TM structures available in the English input. Exemplification alone does not necessarily help since as we have seen, it is regularly mis-parsed in accordance with the Raising strategy. Presumably the disconfirming evidence is provided by cases where the interpretation imposed by the Raising analysis is clearly incompatible with the context (33) or even nonsensical (34):

(33) My cousin is fun to visit: I go and stay with him every summer...
(34) English grammar is easy to learn.

For instance, if (33) is first parsed as a Raising structure and *my cousin* is interpreted as the one doing the visiting, the following context should be sufficient to call into question the initial analysis since *my cousin* is the one who *I stay with*. The sentence would have to be reanalysed with the initial NP interpreted as the object of the embedded verb. Likewise, if (34) is assigned a Raising analysis, i.e., *English grammar* is doing the learning, the resulting interpretation will certainly fail to make sense. Thus the semantics provides the clues to the structural analysis required. Despite the consistency of the Raising analysis in the interlanguage grammar, whenever the resulting interpretation is problematic and incompatible with the context, it can be overridden by the contribution of semantic and pragmatic knowledge. Such conflicts, we may surmise, are one mechanism by which reanalysis can be forced.[7]

A further logical problem involves the question of which adjectives can appear in the TM construction. Some idiosyncratic cases cannot be predicted, such as *possible* which disallows TM:

(35) The music was impossible to hear.
(36) * The music was possible to hear.

This suggests that the adjectives allowing TM must be learnt item-by-item, from positive evidence of their instantiation.

The learnability problem posed to Chinese speakers by TM, then, is a syntactic one which can be phrased in terms of the Subset Principle: "Pseudo-TM" represents overgeneralisation of Raising; there is thus no direct positive evidence which can refute the interlanguage grammar. The solution we have discussed involves disconfirming evidence which is semantic in nature.

5. Conclusion

The general difficulties posed by English Tough Movement structures are compounded in the case of Chinese learners by the existence of superficially similar but structurally distinct L1 constructions. The role of transfer appears to be, as Schachter (1983) suggests, that of an input to hypothesis formation: the L1 Raising structure together with the universal preference for Subject Raising over Object Raising/Tough Movement leads to misanalysis of English TM.

This study illustrates the complexity of interlanguage syntax: the interaction of L1 and L2 constructions and universal factors lead to the over-generalization of Raising in the interlanguage grammar. The contrastive study of the relevant set of constructions in English and Chinese and the typological studies of Raising and TM structures across languages contribute to shed light on the phenomenon. The over-generalization of Raising in the interlanguage poses a serious learnability problem which we have suggested requires the interaction of syntax and semantics for its resolution.

Notes

1. An earlier version of this paper was presented at the International Conference on Syntactic Acquisition at the Chinese University of Hong Kong (July 1989). We are grateful for comments from participants, in particular Thomas Lee and Ken Wexler.

2. They are also referred to as "Object-to-Subject Raising" structures, since they have been analyzed as a case of Raising in some frameworks. We assume that the construction is distinct from Raising, as discussed in section 4.2.

3. Thus for example, TM is subject to subjacency (i) and licenses the marginal "parasitic gap" construction (ii):

(i) * John is hard to find someone that likes [t]
(ii) ? John is hard to criticize [t] without insulting [t]

4. The authors note that in Arabic, the TM counterpart has the verb in the complement clause passivized, such that the English sentence "The pyramids are easy to see" would be "The pyramids are easy to be seen," very much as produced by Chinese speakers. No mention is made of whether the Arabic speakers produced passivized TM sentences spontaneously, their data being based on a comprehension task. This is a case where the combination of production and comprehension data would be the ideal compromise.

5. All three structures were once described in terms of Raising. In current GB theory, however, only Subject-to-Subject Raising (type (ii)) is permitted by the Projection Principle. Type (i) is described as Exceptional Case Marking (ECM) and type (iii) as a case of empty operator movement as discussed in section 2.2.

6. The parallelism in the developmental pattern of purpose clauses and TM structures might be taken as further evidence that TM is distinct from Raising, since a Raising analysis is clearly not applicable to (26).

7. A similar solution is proposed independently by Yamaoka (1988): more "transparent" TM structures such as This book is easy to read do not allow the interpretation in which this book is the underlying subject, and thereby serve as a prototype for the necessary reanalysis.

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《漢-英過渡語的"tough 移動":對比分析與語言獲得可能性》

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本文從中英文對"tough 謂語"的不同處理以及"語言獲得可能性理論"入手，探討"John is hard to please" 這樣的"tough 移動"結構在英語第二語者的漢-英過渡語中的發展。I am easy to forget 和 The instrument is easy to be played 等說法，按"管轄與約束" (Government and Binding) 理論可解釋爲由於"主語提升規則"被錯誤地推廣至"tough 謂語" 而導致。英語中有關句型的難以掌握，除了來自第一語的影響外，還可以從普遍語法原則中找到解釋。

本文在系統闡述有關習得困難時採用"語言獲得可能性理論" (Language Learnability Theory) 的架構，特別是其"子集原則"。學習者要掌握有關正確句型，就得對有關語句重新作出分析，而修正的分析意味著"提升規則"和"被動化規則" 兩者的適用範圍均需縮小。本文並進而指出，句法和語義兩者兼顧，或許是解決上述學習困難的一條出路。

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