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Temporal Reference in Mandarin Chinese

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一、中文摘要

本計畫主要研究中文——一個所謂無構詞時制的語言——如何決定句子的時間指涉。我們就前人研究不足的地方，從新檢視語料，全面性的擴大討論和時間解釋有關的句子，而不侷限在傳統上只包含「著」、「了」、「過」等時態助詞的句子，因此除了一般性的簡單句外，也對複雜句的時間解釋做了非常深入的觀察，有許多的語料都是文獻上第一次被提出來討論的。除了發掘新的語言事實外，我也試圖為漢語的時間解釋提出一套完整的理論系統來詮釋分析漢語句子的時間解釋，這套理論主要是以模型理論真值條件語意學為基礎。我提出不帶任何時間副詞或時態助詞的簡單句，其時間解釋可透過情狀類型的選擇限制來預測，也就是，「現在式」必須選擇（非完整態）同質性情狀當補語，而「過去式」則是選擇（完整態）異質性情狀來當補語，時間副詞則可凌駕選擇限制，由時間副詞所指稱的時間來決定事件所發生的時間。至於帶有「了」和「過」的句子，我提出了「了」是實現體標記，「過」是相對過去時體標記的看法，並且討論這樣的分析和不同情狀類型之間的交互影響。除此之外，我也討論了句尾「了」及詞尾「了」的相同點及相異處，提出兩者具有共同的核心意義這樣的觀點，其不同處只在於句尾「了」多了一個「結果狀態必須與講話時間重疊」的限制。對於從屬子句的時間指稱，我提出證

據證明賓語從屬子句的時間解釋基本上是由主要子句動詞的語意選擇限制來決定。至於關係子句和表時間的副詞子句的時間解釋，我則證明完全無法由主要子句的事件時間（也就是，句法上的控制理論）來預測，而是和主要子句動詞的個別語意，賓語名詞組的語意解釋，限定詞的有定無定、語用推論及百科知識等種種因素一起來決定，我們甚至發現一個（非泛指）關係子句的時間解釋可以同時包含過去、現在及未來的時間。同樣地，表示時間的副詞子句的時間解釋也無法藉由句法上的控制理論來推測，而必須藉由表時間的從屬連接詞對兩個不同子句的時間前後限制，加上語用上的「非瑣碎時間限制」及語用推論來推論句子的時間解釋。

關鍵詞：時制、時態、時間指涉

Abstract

This project discusses how Chinese, a so-called tenseless language, determines its temporal reference. For simplex sentences without time adverb or aspectual marker, I show that temporal reference is correlated with aktionsart or grammatical viewpoint. For sentences with an aspectual marker, I discuss the temporal semantics of *le* and *guo* in detail, showing how their tense/aspectual meanings contribute to

temporal reference. I propose to analyze *le* as an event realization operator and *guo* as an anteriority operator. For subordinate clauses, I show that temporal reference of complement clauses of verbs is basically determined by verbal semantics of individual verbs, which may impose some temporal restriction on the temporal location of the embedded event. As for relative clauses and temporal adverbial clauses, many different factors such as lexical verbal semantics, referential properties of determiners, lifetime effect of noun phrases, semantic or pragmatics constraints on temporal connectives, inference rules and world knowledge, etc., all interact to help determine temporal reference. Many data discussed in this paper indicate that there is no evidence of (covert) tenses in Chinese. Therefore, challenging work remains for those who have claimed that Tense Phrase is projected in Chinese phrase structures.

二、緣由與目的

傳統上研究漢語時制現象的學者，其研究對象多半侷限在帶有時態助詞如「著」、「了」、「過」的句型上，雖然這些研究對於提升時態助詞的瞭解有很多的貢獻，但是因為語料侷限於簡單句，且多假設漢語的時間解釋和時態助詞、時間副詞或上下文有關，所以長久以來，很少有人對於整個漢語時間解釋的影響因素做全面性的討論，也沒有人提出一套較完整的形式理論來對漢語的時間解釋作系統性的詮釋，有鑑於此，我在這個計畫裡，就前人研究不足的地方，從新檢視語料，並試圖為漢語的時間解釋提出一套完整的理論系統來詮釋分析漢語句子的時間解釋。

三、結果與討論

在此計畫裡，我為漢語的時間解釋提出一套完整的理論系統來詮釋分析漢語句子的時間解釋，這套理論主要是以模型理論真值條件語意學為基礎，採用這套理論的主要原因是西方語言學者研究時制時，很多都是以這種理論為基礎，因此這套理論比較有利於日後作對比分析及普遍語法的研究。我提出不帶任何時間副詞或時態助詞的簡單句，其時間解釋可透過情狀類型的選擇限制來預測，也就是，「現在式」必須選擇（非完整態）同質性情狀當補語，而「過去式」則是選擇（完整態）異質性情狀來當補語，時間副詞則可凌駕選擇限制，由時間副詞所指稱的時間來決定事件所發生的時間。我們的理論不僅成功地說明了簡單句的時制指涉，也解釋了帶「得」字補語的時制意義。至於帶有「了」和「過」的句子，我提出了「了」是實現體標記，「過」是相對過去時體標記的看法。我對於「了」和「過」的分析雖然不是全新的概念，但是經過利用形式語意學的方法來重新定義實現體的意義之後，「實現」的意義不僅有了具體內涵，而且也解決了一個從來不曾被成功地解釋過的現象，也就是「了」的「完整態」如「我買了一本書」與「非完整態」如「我養了一條金魚」的衝突。有共同的核心意義這樣的觀點，其不同處只在於句尾「了」多了一個「結果狀態必須與講話時間重疊」的限制。至於從屬子句的時間指稱，我提出證據證明賓語從屬子句的時間解釋基本上是由主要子句動詞的語意選擇限制來決定，某些動詞如「決定」要求補語子句的事件時間在主要子句的事件時間之後，有些動詞如「後悔」則要求補語子句的事件時間在主要子句的事件時間之前，還有些動詞如「喜歡」則要求補

語子句的事件時間與主要子句的事件時間重疊，另外像「認為」這類動詞則對補語子句的事件時間不做強制性之規範。至於關係子句和表時間的副詞子句的時間解釋，我則證明和主要子句動詞的個別語意，賓語名詞組的語意解釋，限定詞的有定無定、語用推論及百科知識等種種因素一起來決定。我們甚至發現一個（非泛指）關係子句的時間解釋可以同時包含過去、現在及未來的時間，這些結果暗示漢語可能沒有句法上時制節點的存在，因而對於主張漢語應該有隱形時制這樣的論點構成極大的挑戰。同樣地，表示時間的副詞子句的時間解釋也無法藉由句法上的控制理論來推測，而必須藉由表時間的從屬連接詞對兩個不同子句的時間前後限制，加上語用上的「非瑣碎時間限制」及語用推論來推論句子的時間解釋。

四、計畫成果自評

總而言之，我們的研究結果不僅在語言事實上有新的發現，在理論分析上也跳出前人假設的框框，深入討論許多前人不曾討論過，卻對漢語時間解釋有非常大影響的因素，因而提升了我們對於漢語時間解釋系統的全盤性瞭解，這對於日後研究漢語時制和時態的學者不僅有相當大的啟發作用，對於有興趣作不同語言的對比分析研究或是普遍語法研究的學者，也提供了非常有用的比較基礎，我們的研究成果“Temporal Reference in Mandarin Chinese”也已經發表在 2003 年國際期刊 *Journal of East Asian Linguistics* 12: 259-311。

五、參考文獻

1. Binnick, Robert I. (1991) *Time and the Verb: A Guide to*

Tense and Aspect, Oxford University Press, New York.

2. Bohnemeyer, Jürgen and Mary Swift (2001) “Default Aspect: The Semantic Interaction of Aspectual Viewpoint and Telicity,” *Proceedings of Perspectives on Aspect*, Utrecht Institute of Linguistics, 2001.

3. Amherst. Chan, Marjorie (1980) “Temporal Reference in Mandarin Chinese: An Analytic-Semantic Approach to the Study of the Morphemes *le*, *zai*, *zhe* and *ne*,” *Journal of the Chinese Language Teachers' Association* 15, pp. 33–79.

4. N. Carlson and Francis Jeffrey Pelletier (eds.), *The Generic Book*, University of Chicago Press, Chicago, pp. 176–223.

5. Comrie, Bernard (1976) *Aspect: An Introduction to the Study of Verbal Aspect and Related Problems*, Cambridge University Press, Cambridge.

6. Comrie, Bernard (1985) *Tense*. Cambridge University Press, Cambridge.

7. Dai, Yaojing (1994) “Le Zai Biaoshi Weilai Yiyi Juzi Zhong De Yongfa [Usage of Le in Sentences Expressing Future Meaning],” in Zhihong Yu (ed.), *Xiandai Yuyanxue: Lilun Jianshe De Xin Shikao*, Yuwen Chubanshe, Beijing, pp. 115–122.

8. Dowty, David (1979) *Word Meaning and Montague Grammar: The Semantics of Verbs and Times in Generative Semantics and in Montague's PTQ*, D. Reidel, Dordrecht.

9. Erbaugh M. and C. S. Smith (2001) “Temporal Information in Sentences of Mandarin,” Manuscript, University of Texas and City University of Hong Kong.

10. Grice, H. P. (1975) “Logic and Conversation,” in P. Cole and J. L. Morgan (eds.), *Syntax and Semantics, 3: Speech Acts*, Academic Press, New York, pp. 41–58.

11. Heim, Irene (1982) *The Semantics of Definite and Indefinite Noun Phrases*, PhD dissertation, University of Massachusetts, Amherst.

12. Huang, L. Meei-jin (1987) *Aspect: A General System and its Manifestation in Mandarin Chinese*, PhD dissertation, Rice University.

13. Jin, Lixin (2002) “Ciwei ‘Le’ De Shiti Yiyi Ji Qi Jufa

14. Kamp, H. and Uwe Reyle (1993) *From Discourse to Logic: Introduction to Model Theoretic Semantics of Natural*

- Language, Formal Logic and Discourse Representation Theory*, Kluwer Academic Publishers, Dordrecht.
15. Kang, Jian (1999) *The Composition of the Perfective Aspect in Mandarin Chinese*, PhD dissertation, Boston University, Boston.
15. Klein, Wolfgang (1994) *Time in Language*, Routledge, London.
16. Klein, Wolfgang, Li Ping and Henriette Hendriks (2000) "Aspect and Assertion in Mandarin Chinese," *Natural Language and Linguistic Theory* 18, pp. 723–770.
17. Kong, Linda (1986) "Guanyu Dongtai Zhuci 'Guo₁' Han 'Guo₂' [On Dynamic Particles *Guo₁* and *Guo₂*]," *Zhongguo Yuwen* 4, pp. 272–280.
18. Kratzer, Angelika (1994) *The Event Argument and the Semantics of Voice*, Manuscript, University of Massachusetts, Amherst.
19. Kratzer, Angelika (1998) "More Structural analogies Between Pronouns and Tenses," SALT 8, Proceedings From the 8th Conference of Semantics and Linguistic Theory, MIT, 1998, pp. 92–110.
20. Krifka, Manfred (1989) "Nominal Reference, Temporal Constitution and Quantification in Event Semantics," in R. Bartsch, J. van Benthem, and P. van Emde Boas (eds.), *Semantics and Contextual Expression*, Foris, Dordrecht, pp. 75–115.
21. Kusumoto, Kiyomi (1999) *Tense in Embedded Contexts*, PhD dissertation, University of Massachusetts, Amherst.
- Li, Charles N. and Sandra A. Thompson (1981) *Mandarin Chinese: A Functional Reference Grammar*, University of California Press, Berkeley.
22. Li, Charles N., Sandra A. Thompson and R. M. Thompson (1982) "The Discourse Motivation for the Perfect Aspect: the Mandarin Particle LE", in Paul Hopper (ed.), *Tense and Aspect: Between Semantics and Pragmatics*, John Benjamins Publishing Company, Amsterdam.
23. Li, Tiegen (1999) *The Study of Tense in Modern Chinese*, Liaoling University Press, Shenyang.
24. Lin, Jo-wang (2000) "On the Temporal Meaning of the Verbal *-le* in Chinese," *Language and Linguistics* 1(2), pp. 109–133.
25. Lin, Jo-wang (2002) "Selectional Restrictions and Temporal Reference of Chinese Bare Sentences," *Lingua* 113, pp. 271–302.
26. Liu, Yuehua (1988) "Dongtai Zhuci 'guo₁', 'guo₂', 'le₁' Yongfa Bijiao [A Compariative Study of the Dynamic Particles *Guo₁*, *Guo₂* and *Le₁*]," *Yuwen Yanjiu* 1, pp. 6–16.
27. Liu, Xunning (1988) "Xiandai Hanyu Ciwei 'le' DE Yufa Yiyi," *Zongguo Yuwen* 5, pp. 321–330.
28. Liu, Xiaomei (1997) *Guo Ming Ke Yu De Dongtai Wenfa Tixi Ji Dongtaici De Shangjia Dongmao Yuyi* [The Grammatical System of Mood in Mandarin Chinese, Southern Min Chinese and Haka Chinese and the Aspectual Meanings of Aspectual Markers], Crane Publishing, Taipei.
29. Mangione, L. and Dingxuan Li (1993) "A Compositional Analysis of *-Guo* and *-Le*", *Journal of Chinese Linguistics*, pp. 65–122.
30. Mochizuki, Keiko (2000) "Hanyu Li De Wancheng Ti [The Perfect Aspect in Chinese]," *Hanyu Xuexi* 1, pp. 12–16.
32. Ogihara, Toshiyuki (1989) *Temporal Reference in English and Japanese*, PhD dissertation, University of Texas, Austin.
33. Ogihara, Toshiyuki (1996) *Tense, Attitudes and Scope*, Kluwer Academic Publishers, Dordrecht.
34. Partee, Barbara H. (1984) "Nominal and Temporal Anaphora," *Linguistics and Philosophy* 7, pp. 243–286.
35. Ross, Claudia (1995) "Temporal and Aspectual Reference in Mandarin Chinese," *Journal of Chinese Linguistics* 23, pp. 87–135.
36. Shi, Zhiqiang (1990) "Decomposition of Perfectivity and Inchoativity and the Meaning of the Particle *Le* in Mandarin Chinese," *Journal of Chinese Linguistics* 18, pp. 95–124.
37. Stowell, Tim (1993) "Syntax of Tense," Manuscript, University of California, Los Angeles.
38. de Swart, Hënriette (1998) "Aspect Shift and Coercion," *Natural Language and Linguistic Theory* 16, pp. 347–385.
39. Teng, Shou-hsin (1975) *A Semantic Study of Transitivity Relations in Chinese*, University of California Press, Berkeley.
40. von Stechow, Arnim (2001) "Temporally Opaque

Arguments in Verbs of Creation,” in Carlo Cecchetto, Gennaro Chierchia, and Maria Tessa Guasti (eds.), *Semantic Interfaces*, CSLI Publications, Stanford, pp. 278–319.

41. Wang, William S. Y. (1965) “Two Aspect Markers in Mandarin,” *Language* 41, pp. 457–470.

42. Yeh, Meng (1996) “An Analysis of the Experiential GUO_{EXP} in Mandarin Chinese: A Temporal Quantifier,” *Journal of East Asian Linguistics* 5, pp. 151–182.

Temporal Reference in Mandarin Chinese*

This paper discusses how Chinese, a so-called tenseless language, determines its temporal reference. For simplex sentences without any time adverb or aspectual marker, I show that temporal reference is correlated with aktionsart or grammatical viewpoint. For sentences with an aspectual marker, I discuss the temporal semantics of *le* and *guo* in details, showing how their tense/aspectual meanings contribute to temporal reference. I propose to analyze *le* as an event realization operator and *guo* as an anteriority operator. For subordinate clauses, I show that temporal reference of complement clauses of verbs is basically determined by verbal semantics of individual verbs, which may impose some temporal restriction on the temporal location of the embedded event. As for relative clauses and temporal adverbial clauses, many different factors such as lexical verbal semantics, referential properties of determiners, lifetime effect of noun phrases, semantic or pragmatics constraints on temporal connectives, inference rules and world knowledge, etc., all interact to help determine temporal reference. Many data discussed in this paper indicate that there is no evidence of (covert) tenses in Chinese. Therefore, it remains a challenging work for those who have claimed that Tense Phrase is projected in Chinese phrase structures.

1. Introduction

The study of temporal reference in natural language has been one of the most important issues in the history of linguistic research. This is especially the case for Indo-European languages such as English, because distinctions of times in these languages are directly encoded by verbal inflections. In fact, tense and aspect in these

languages have been studied for almost twenty-five hundred years since at least the time of the ancient Greeks and the results are very fruitful as Binnick's (1991) book *Time and the Verb* has shown us. In contrast to Indo-European languages, works on temporal reference in Chinese are relatively meager and the breadth and depth of research are far behind those of Indo-European languages. One reason for this, undoubtedly, is that the Chinese language, unlike Indo-European languages, does not have the same kind of verbal inflections to indicate distinctions of times. Of course, not having finite verb forms does not mean that Chinese is not able to express the notion of time. When hearing a Chinese sentence, any native speaker can immediately tell whether the situation described by that sentence holds at a past time, a future time or the speech time. Interesting questions then arise as to how temporal reference of Chinese sentences is determined and to what extent the mechanisms that the Chinese language uses are different from those used in Indo-European languages. In this paper, I will not be able to probe into the second question but I will attempt to give an answer to the first question in some details based on a wide range of data.

This paper is organized as follows. Section 2 outlines the basic assumptions and the theoretical framework that I adopt. Section 3 is devoted to an analysis of how bare sentences in Chinese obtain their temporal reference. Section 4 investigates how different aspectual markers such as the perfective marker *le* and the experiential marker *guo* affect temporal reference. Section 5 to section 8 discusses temporal reference of subordinate clauses such as complement clauses of verbs, relative clauses and adverbial clauses. Section 9 concludes this article.

2. Basic Assumptions and Theoretical Framework

In this section, I will give a brief overview of the theoretical assumptions about tense

and aspect that I will be adopting for a better understanding of the discussion that will follow. Traditionally, tenses are understood as the location of an event or state in time axis relative to a reference time, which is usually the speech time (Comrie (1985)). When an event or state takes place or holds before the speech time, the tense is past tense; when the situation is reversed, the tense is future tense; when a process or state overlaps with the speech time, the tense is present tense. As for the notion of aspect, it is often characterized as different ways of presenting a situation as a completed whole, viewed as if from outside, or as an ongoing, incomplete action or state, viewed as if from inside (Comrie (1976)). The former is called perfective aspect and the latter imperfective aspect. The perfective vs. imperfective distinction is often realized through grammaticalized affixes or auxiliaries. Klein (1994) finds the traditional definition of aspect imprecise. Therefore, he proposes to replace the definitions of tense and aspect with temporal relations. He has distinguished three times: the time of utterance (TU), the time span at which a situation obtains (T-SIT or time of situation) and the time span about which an assertion is made (TT or topic time). On his analysis, tense does not express a temporal relation between TU and T-SIT as in the classical analysis, but one between TT and TU. Aspect, on the other hand, expresses a temporal relation between TT and T-SIT. In particular, perfective aspect requires that the situation time is included within the topic time, whereas imperfective aspect is the other way around or involves an overlap relation.¹ This paper accepts Klein's (1994) distinction of tense and aspect and will recast his notions of tense and aspect within a framework of model-theoretic semantics. Although my theoretical framework will be model-theoretic semantics, I will keep the formal mechanisms as few as possible and plain English will be provided to explain what the intuitive idea is behind the logical language. Therefore, in most cases, the reader can actually understand the discussion without too much background on formal logic.

Now some theoretical assumptions are in order. In this paper, I assume that verbs, stative or non-stative, have an event argument and that sentence meanings are properties of eventualities, i.e., λeW , where W contains a free occurrence of the eventuality variable e . With the introduction of event arguments to the argument structures of verbs, I need to assume that in addition to the normal semantic types e (entity) and t (truth-value), there is a semantic type s , standing for situations, events or states. In addition, I also assume another semantic type i standing for intervals.

For the syntax, I assume that above VP is an aspectual phrase AspP. The perfective vs. imperfective distinction is stated at the head of AspP. Above AspP is AgrsP. Tense Phrase (TP) is located above AgrsP. (The relative order between AgrsP and TP is not important.) Klein's topic time occupies the specifier position of TP. In addition, I adopt the VP-internal subject hypothesis as proposed in Kitagawa (1986) and Koopman and Sportiche (1991), though this is not crucial.

It is worth noting that the TP projection is assumed for Chinese phrase structures only as a working hypothesis for comparison. I do not commit myself to the claim that tenses and TP exist in Chinese, because the information provided by AspP and topic time seems generally sufficient to explain temporal locations of eventualities denoted by Chinese sentences. I will bring up this issue from time to time later when I discuss the Chinese data.

With the above assumptions, I now formalize Klein's analysis of tense and aspect as in (1)-(2) (cf. Kratzer (1998); Bohnemeyer and Swift (2001)), where t_2 stands for the topic time and the symbol $\#$ denotes Krifka's (1989) temporal trace function, a partial function which when applied to an eventuality yields its "run time". Thus, $\#(e)$ is equivalent to the situation time of the eventuality e . Finally, s^* stands for the speech time.

- (1) a. perfective aspect =: $\lambda P_{\langle s,t \rangle} \lambda t_2 \lambda e [\tau(e) \subseteq t_2 \wedge P(e)]$
 b. Imperfective Aspect =: $\lambda P_{\langle s,t \rangle} \lambda t_2 \lambda e [t_2 \subseteq \tau(e) \wedge P(e)]$
- (2) a. [+ present] =: $\lambda P_{\langle i, \langle s,t \rangle \rangle} \lambda t_2 \lambda e [P(t_2)(e) \wedge s^* \subseteq t_2]$
 b. [+ past] =: $\lambda P_{\langle i, \langle s,t \rangle \rangle} \lambda t_2 \lambda e [P(t_2)(e) \wedge t_2 < s^*]$

To take the English sentence (3) as an illustration, let us see how the above definitions work. Within Klein's framework, the meaning of (3) is paraphrased as follows: The situation time of the proposition **John worked** is included within the topic time *zuotian* 'yesterday' because of the perfective aspect and this topic time must precede the utterance time because of the past tense. Therefore, the situation time of John's working must be in the past. The temporal meaning of (3) is formally computed as in (4).

(3) $[_{CP} [_{TP} \text{yesterday} [_{T'} T_{[+past]} [_{AgrsP} \text{John}_x [_{AspP} Asp_{[+perfective]} [_{VP} x \text{worked}]]]]]]]$

(4) $[[VP]] = \lambda e \text{work}'(x)(e)$

$$\begin{aligned} [[AspP]] &= \lambda P_{\langle s,t \rangle} \lambda t_2 \lambda e [\tau(e) \subseteq t_2 \wedge P(e)] (\lambda e \text{work}'(x)(e)) \\ &= \lambda t_2 \lambda e [\tau(e) \subseteq t_2 \wedge \text{work}'(x)(e)] \end{aligned}$$

$$\begin{aligned} [[AgrsP]] &= \lambda x \lambda t_2 \lambda e [\tau(e) \subseteq t_2 \wedge \text{work}'(x)(e)] (\text{John}')^{ii} \\ &= \lambda t_2 \lambda e [\tau(e) \subseteq t_2 \wedge \text{work}'(\text{John}') (e)] \end{aligned}$$

$$\begin{aligned} [[T']] &= \lambda P_{\langle i, \langle s,t \rangle \rangle} \lambda t_2 \lambda e [P(t_2)(e) \wedge t_2 < s^*] (\lambda e \lambda t_2 [\tau(e) \subseteq t_2 \wedge \text{work}'(\text{John}') (e)]) \\ &= \lambda t_2 \lambda e [\tau(e) \subseteq t_2 \wedge \text{work}'(\text{John}') (e) \wedge t_2 < s^*] \end{aligned}$$

$$[[TP]] = \lambda e [\tau(e) \subseteq \text{yesterday} \wedge \text{work}'(\text{John}') (e) \wedge \text{yesterday} < s^*]$$

$$[[CP]] = \exists e [\tau(e) \subseteq \text{yesterday} \wedge \text{work}'(\text{John}') (e) \wedge \text{yesterday} < s^*] \text{ (Default Existential Closure)}$$

3. Temporal Reference of Chinese Bare Sentencesⁱⁱⁱ

An assumption commonly held by Chinese linguists is that Chinese conveys temporal locations of eventualities via temporal adverbs such as *zuotian* ‘yesterday’, *ming nian* ‘next year’, aspectual markers such as *le* and *guo* or some previous sentences which set up a time frame for the discourse. However, if we carefully look at the data, we will find that a large number of Chinese sentences do not contain a time adverb or aspectual marker. Nor is it necessary to resort to previous utterances to determine their temporal reference. For example, independently of any context, the sentences in (5) and (6), which do not contain any time adverb or aspectual marker, can be easily construed as referring to past and present situations, respectively.

(5) a. Ta dapuo yi ge hua ping

he break one Cl flower vase

‘He broke a flower vase.’

b. Ta ba wo gang-chu jiaoshi

he Ba me drive-out classroom

‘He drove me out of the classroom.’

c. Ta zai Shanghai chu-sheng

he in Shanghai give-birth

‘He was born in Shanghai.’

d. Ta qiangpuo wo xiu ta-de ke

he force me take his class

‘He forced me to take his class.’

e. Didi bang wo xiang-dao yi-ge hen hao de fangfa

brother help me think-of one-Cl very good De method

‘Brother thought of a very good idea for me.’

- (6) a. Ta hen congming
 he very clever
 ‘He is very clever.’
- b. Wo xiangxin ni
 I believe you
 ‘I believe you.’
- c. Diqiu rao taiyang xuanzhuan
 earth turn sun around
 ‘The earth turns around the sun.’
- d. Ni da lanqiu ma?
 you play basketball Q
 ‘Do you play basketball?’
- e. Ta zai fangjian du shu
 he in room study book
 ‘He is studying in his room.’

If we assume that Chinese has tenses, then the tenses in those examples in (5)-(6) must be covert tenses. The problem is then to determine the value of those covert tenses. The suggestion that I would like to make is this. Following de Swart (1998) and Schmitt (2001), I assume that tenses are subject to selectional restrictions. Thus, a certain tense can only select a complement with a specific aspectual viewpoint or aktionsart. On these assumptions, the values of covert tenses in Chinese, if they exist, can be determined by the following selectional restrictions.

- (7) a. Covert present tense must select imperfective AspP as its complement
 b. Covert past tense must select perfective AspP as its complement

In order for the above selectional restriction to work, I will rely on Bohnemeyer and Swift's (2001) cross-linguistic study about "default aspect" in natural language.^{iv} In their paper, they have argued that there is a certain correlation between the telicity of an eventuality description and its aspectual viewpoint. Briefly, a predicate is telic if it denotes only events that have no part that falls under the same predicate. A predicate is atelic if the events it denotes have at least one non-final part that falls under the same predicate. On this definition, *eat a fish* is a telic predicate, whereas *walk on the beach* is atelic. According to them, cross-linguistically the default aspectual viewpoint of telic descriptions is perfective viewpoint, whereas the default aspectual viewpoint of atelic descriptions is imperfective viewpoint. Moreover, such a correlation may manifest itself through morphological markedness relations. For instance, there are languages such as Russian and Yukatek Maya, which have marked imperfective aspect and unmarked perfective aspect for telic predicates. Chinese can be added to this category. For telic predicates such as *chi yi-tiao yu* 'eat a fish', they are interpreted perfectly. But if they are combined with *zai* such as *zai chi yi-tiao yu* 'be eating a fish', they are interpreted imperfectively. Bohnemeyer and Swift (2001) have proposed an account for the correlation between (a)telicity and aspectual viewpoint in terms of the notion of "default aspect", which is perfective for a telic predicate and imperfective for an atelic predicate. I will assume this notion of default aspect without further discussing their formal definitions.

Given Bohnemeyer and Swift's notion of default aspect, I am now able to explain why the sentences in (5) have a past interpretation and those in (6) have a present interpretation: the former all describe perfective telic situations, whereas the latter all denote imperfective atelic situations. Thus, according to the selectional restrictions stated in (7), the covert tenses in examples like those in (5) must be past tense and the

covert tenses in examples like those in (6) must be present tense. The semantic computation of such sentences is straightforward, so I omit the details.

It should be noted that bare sentences contrast with sentences containing a time adverb. For the latter kind of sentence, the time adverb determines temporal reference. For example, in (8), though all the sentences contain the same homogeneous predicate *hen mang* ‘very busy’, temporal reference of the sentence varies with the time adverb.

- (8) a. Ta zuotian hen mang
he yesterday very busy
‘He was very busy yesterday.’
- b. Ta xianzai hen mang
he now very busy
‘He is very busy now.’
- c. Wo mingtian hen mang
I tomorrow very busy
‘I will be very busy tomorrow.’

In order to capture the fact that time adverbs override tense selections stated in (7), I propose that the tense node, if it exists, must agree with the overt time adverb in the specifier position of TP (cf. Lin (2002), Erbaugh and Smith (2001)).

Before moving to next section, two remarks are in order. One is that except in few constructions such as conditionals or imperatives, future tense in Chinese cannot be an empty tense. That is why we do not have a selectional restriction for covert future tense in (7). Future time in Chinese must be expressed by an overt expression indicating future time such as the future time adverb *mingtian* ‘tomorrow’ or the modal auxiliary *hui* ‘will’. Even though conditionals such as *Ruguo ta lai, wo jiu zou*

'If he comes, I'll go' may express a future time without an overt expression indicating a future time, it has been argued that such constructions contain an implicit modal in the matrix clause (Heim (1982); von Stechow (1994), among many others.) If this is correct, temporal reference of conditionals is determined by an implicit modal equivalent to *hui* 'will' in force. As for imperatives, such constructions universally refer to future actions. This, I believe, should be ascribed to the special semantics or pragmatics of imperatives, which I will not discuss here.

The other remark has to do with the question of whether or not Chinese has (covert) tenses. In the above discussion, I have assumed that (covert) tenses exist in Chinese and resort to selectional restrictions to interpret their values in bare sentences. Can we explain the same facts without assuming existence of (covert) tenses? The answer seems to be positive. We only need to fill in the value of the topic time introduced by Asp, which specifies a relation between event time and topic time. If a sentence does not contain an overt time adverb, the topic time is generally some time interval determined by the context such as the speech time. However, for a non-future perfective durative sentence, the topic time must be a past interval rather than the speech time, because a durative event cannot be included within the speech time. Similarly, for a non-future perfective instantaneous achievement, the topic time must also be in the past because the event denoted by an achievement must have already been completed before one is able to talk about that situation. These are independent constraints independent of theories of tenses. As for imperfective sentences, the topic time is the default speech time unless some time adverb appears in the sentence. I conclude that bare sentences are no evidence for the projection of TP because with or without covert tenses, one can equally predict the temporal locations of eventualities denoted by them.

4. Aspectual Markers and Chinese Temporal Reference

Having discussed how temporal reference of bare sentences is determined, I now turn to sentences with an aspectual marker such as *le* and *guo*, discussing how they contribute to temporal reference of sentences.

The literature on Chinese *le* and *guo* is so huge that it is impossible to give even a brief overview here, due to restrictions of space (Kong (1986); Huang (1987); Xunning Liu (1988); Yuehua Liu (1988); Shi (1990); Magione and Li (1993); Dai (1994); Ross (1995); Yeh (1996); Liu (1997); Li (1999); Kang (1999); Lin (2000b); Klein, Li and Hendrik (2000); to mention just a few). So in this paper, I will focus more on my own view of these markers, leaving the comparison to the reader.

The verbal suffix *le* has often been characterized as a perfective marker indicating completion or termination of an action or inchoativity of a state. To illustrate, consider (9), which clearly describes a past event.

(9) Ta chi-le yi tiao yu

he eat-Asp one-Cl fish

‘He ate a fish.’

According to Magione and Li (1993), sentences like (9) do not describe just any past events but past events that occur within a certain reference time. Although sentences with *le* usually have a past interpretation indicating completion or termination of an action, *le* is actually compatible with a present continuative interpretation (cf. Xunning Liu (1988); Lin (2000b); Jin (2002)). Consider the following examples.

(10) a. Ta yang-le yi-tiao jinyu

he raise-Asp one-Cl goldfish

‘He is raising a goldfish.’

b. Wo (zai Boston) zu-le yi-jian gongyu

I in Boston rent-Asp one Cl apartment

‘I am renting an apartment in Boston.’

c. Zhangsan (shou-li) ti-le yi-ge da pixiang

Zhangsan hand-in carry-Asp one-Cl big suitcase

‘Zhangsan is carrying a big suitcase (in his hand).’

d. Ni kan, Lisi qi-le yi-pi ma wang cheng wai fangxiang zou,

you look Lisi ride-Asp one-Cl horse toward town outside direction walk

bu zhidao ta yao qu nar

not know he want go where

‘Look! Lisi is riding a horse toward the direction of the outside of town. I

wonder where he wants to go.’

The syntactic constructions of (10a-c) are identical to the construction of (9), but their temporal meanings are quite different. Unlike (9), which refers to a past completed event, (10a-c) do not describe completed or terminated events but present on-going situations. Although these sentences are not progressive sentences, they are translated as such to indicate that the event has begun before the speech time and is still on-going.^v An important property distinguishing the sentences in (10) from (9) seems to be this. When a sentence of the type in (10) is true of an interval, every subinterval of that interval or a non-final subinterval of that interval can make the same sentence true. For example, if John rents an apartment from April to August in 2002, then it is also true that he rents an apartment in May or in June. But if John eats a fish from 5:30:PM to 5:45PM, it is not true that he also eats a fish from 5:35Pm to 5:40PM.

This property is known as the subinterval property of atelic predicates (Dowty (1979)).^{vi} Interestingly and mysteriously, however, not every atelic predicate is compatible with the verbal *le*. In fact, many activity predicates are incompatible with *le*. This empirical fact can be clearly illustrated with the contrast between (11a) and (11b).

- (11) a. *Zhangsan kan-le yi-zhi niao
 Zhangsan watch-Asp one Cl bird
 ‘Zhangsan is watching a bird./Zhangsan watched a bird.’
- b. Zhangsan kan-le yi-bu dianying
 Zhangsan watch-Asp one-Cl movie
 ‘Zhangsan watched a movie.’

Although both (11a) and (11b) use the same verb *kan* ‘watch’, their aktionsart depends upon the object NP. When the object NP is *yi-zhi niao* ‘a bird’, the VP is an atelic activity predicate; when the object NP is *yi-bu dianying* ‘a movie’, the VP is a telic accomplishment predicate. However, (11a) is ill-formed regardless of what interpretation is assigned to it. But (11b) is perfect with a past interpretation. It is not clear to me what property distinguishes those atelic sentences which are compatible with *le* and those which are not and I will not try to provide a solution to this problem. My main concern will be on the question of how those sentences in (10) obtain a present continuative interpretation.

Like those non-stative verbs in (10), stative verbs may also sometimes take the verbal *le*, giving rise to a present continuative reading.

- (12) a. Ni you-le laopuo, jiu bu yao dieliang

you have-Asp wife then not want parents

‘You have had a wife. So you don’t want your parents.’

b. Ta yijing zhidao-le na-jian shi

he already know-Asp that-Cl matter

‘He has already known that matter.’

c. Jingguo ta-de jiangjie, wo duoshao liaojie-le yi dian GB lilun

After his explanation I more-or-less understand a little GB theory

‘After his explanation, I more or less understand a little bit of GB theory.’

The examples in (10) and (12) clearly indicate that the verbal suffix *le* is not an absolute past tense marker. This is further supported by the fact that *le* may also appear in a clause with a future interpretation as in (13).

(13) Deng ni bi-le-ye yihou, wo hui mai yi-bu che gei ni

Wait you graduate-Asp after I will buy one-Cl car for you

‘After you have graduated, I will buy a car for you.’

In (13), the meaning of *le* seems to indicate anteriority of the embedded clause to the matrix clause (Dai (1994); Lin (2000b)).

In contrast, if the marker *le* in (9) and (10) is replaced with the experiential marker *guo*, the sentences are all unambiguously interpreted as terminated past events. This is illustrated by (14a) and (14b).

(14) a. Ta chi-guo yi-tiao jinyu

he eat-Asp one-Cl goldfish

‘He ate a goldfish (before).’

b. Ta yang-guo yi-tiao jinyu

he raise-Asp one Cl goldfish

‘He raised a goldfish (before).’

c. Wo (zai Boston) zu-guo yi-jian gongyu

I in Boston rent-Asp one-Cl apartment

‘I rented an apartment in Boston (before).’

Thus, *guo* is more like a past tense marker than *le* is. Nevertheless, like *le*, *guo* cannot be an absolute past tense marker, either, because it is also compatible with a future interpretation when it appears in an embedded clause. This is illustrated by (15).

(15) Deng ni ting-guo ta tan gangqin yihou, ni jiu hui zhidao ta de jiqiao you

wait you hear-Asp he play piano after you then will know he De skill have

duo hao

how good

‘After you have heard him play the piano, you will know how good his skill is.’

Although *guo* in (15) is not construed as an absolute past tense marker, it still expresses relative anteriority; namely, the event denoted by the subordinate clause containing *guo* must precede the event denoted by the matrix clause.

4.1 *A Temporal Semantics for Le*

As we saw above, temporal interpretation of sentences containing the verbal *le* is sensitive to the aktionsart of VP. When the VP is of a type such as *chi-yi-tiao-yu* ‘eat a fish’, i.e., a telic predicate, the event denoted by the sentence is construed as a past

event. When the VP is of a type such as *zu yi-jian gongyu* ‘rent an apartment’ or *yang yi-tiao yu* ‘raise a fish’, i.e., atelic predicates, the sentence obtains a present continuative interpretation. This situation raises a very interesting question. When a sentence with *le* refers to a past event, the aspectual viewpoint is certainly perfective. However, when it has a present continuative interpretation, the aspectual viewpoint seems to be imperfective., because the situation is incomplete. As a consequence, we have a dilemma with respect to the interpretation of *le*, which is sometimes interpreted perfectly and sometimes imperfectively. In this section, I will propose an analysis that explains the perfective-imperfective dilemma brought about by *le*.

Xunning Liu (1988) is the first to suggest that the verbal *le* is better treated as a “realization aspect” instead of a completive marker. I agree with his informal idea that the verbal *le* indicates that an eventuality is realized and believe that once formalized, the realization analysis of *le* can provide a very neat account for the seemingly contradictory meanings of *le*, i.e., the perfective-imperfective paradox. I will also extend the realization analysis to account for sequence of tense in embedded contexts.

The analysis that I will be proposing is based upon the concept of ‘event realization’ defined by Bohnemeyer and Swift (2001). As mentioned earlier, Bohnemeyer and Swift have tried to define a “notional aspect operator” that may derive the fact that the default aspectual viewpoint of a telic predicate is perfective, whereas that of an atelic predicate is imperfective. In order to achieve this goal, they define a concept of event realization as given in (16) and utilize it in their definition of ‘notional aspect operator’, which need not concern us here.

$$(16) \forall P, e, t \subseteq E [\text{REAL}_E(P, e, t) \leftrightarrow P(e) \wedge \exists e' [P(e') \wedge e' \leq_E e \wedge t_{\text{SIT}}(e') \subseteq t]]$$

In (16), T_{SIT} is equivalent to the temporal trace function \neq . In plain English, (16) says

that for an event e denoted by P to be realized at a (topic) time interval t , t must contain the run time t_{STR} of a part e' of e such that e' is also a P . This definition of event realization has a very interesting consequence for telic and atelic eventualities. That is, for a telic event to be realized, we need a perfective viewpoint whereas an atelic eventuality only requires an imperfective viewpoint to entail event realization. In other words, a telic eventuality is realized only when the eventuality culminates but an atelic eventuality can be realized as long as a subpart of it holds. Although Bohmeyer and Swift's concern of their paper is not about Chinese *le*, I will employ their definition of event realization to account for the meaning of *le*.

With Bohmeyer and Swift's concept of event realization in mind, I would like to suggest that the verbal *le* in Chinese is just an event realization operator (cf. Xunning Liu (1988)), whose definition is given in (17). In plain English, (17) says that when the meaning of *le* is applied to a property of events, i.e., sentence meaning, there must exist an event e denoted by P and a subpart e' of e that also falls under P is contained within the topic time t_2 .

(17) A preliminary version of the meaning of *le*

$$[[\mathbf{le}]] = \lambda P_{\langle s, t \rangle} \lambda t_2 \lambda e \exists e' [P(e) \wedge P(e') \wedge e' \leq_E e \wedge \tau(e') \subseteq t_2]$$

For example, applying this meaning of *le* to (10b), we get the following truth conditions: There is an event e of **Ta zu yi-jian gongyu** 'he rents an apartment' and this event has a subpart that is included within the topic time. Since (10b) does not have an overt time adverb, the default topic time is now. This amounts to saying that a subpart of the eventuality, which is also an eventuality of **Ta zu yi-jian gongyu** 'he rents an apartment', is included within the time denoted by now. This then entails a present on-going reading of the renting event. On the other hand, if an overt time

adverbial such as *qu nian* ‘last year’ is added to the sentence as in (18) below, it is possible to get a past reading.

- (18) *Qu nian ta zu-le yi-jian gongyu*
last year he rent-Asp one CL apartment
‘He rented an apartment last year.’

Notice that (18) does not assert that the whole event must be included within the topic time denoted by *qu nian* ‘last year’. It only claims that a subpart of it must be contained within it. Therefore (18) is compatible with a situation where the renting event is still on-going this year. This is confirmed by the fact that (18) can be followed by (19).

- (19) *Bu zhidao jin nian ta shi-bu-shi hai zhu zai na jian gongyu li*
not know this year he be-not-be still live in that CL apartment in
‘I wonder if he still lives in that apartment this year.’

However, if the subpart of event that is contained within the topic time happens to be the whole event itself, we do get a reading according to which the whole renting event is terminated.

The same remarks and analysis applies to stative sentences with *le* such as those examples in (12). So I will not repeat the details.

In my above exposition of the meaning of *le*, I intentionally left out discussion of tenses. Now let me make some remarks on this matter. Suppose that like other perfective or imperfective markers, a realization operator is an aspectual operator that is located in Asp. Then the above-proposed analysis of *le* implies that temporal

location of situations described by sentences with *le* can be determined without reference to a tense node. In other words, the TP projection is not necessary for Chinese at least for sentences with the verbal *le* is concerned.

But what if Chinese does have a tense node? If this is the case, one can assume that *le* is a viewpoint-neutral realization operator. The actual aspectual viewpoint of AspP headed by *le* is determined by the aktionsart of VP. As Bohnemeyer and Swift (2001) have argued, “atelic predicates require merely imperfective aspect for the entailment of realization, whereas telic predicates require minimally perfective aspect to entail realization”. Thus, when *le* occurs with an atelic predicate, the aspectual viewpoint is imperfective; when it occurs with a telic predicate, the aspectual viewpoint is perfective. It follows from this that when *le* occurs with an atelic predicate and no overt time adverb appears, the covert tense must be present tense, which in turn forces the topic time to be now. However, if an overt time adverb appears as in (18), the tense must agree with the time adverb as discussed earlier. This analysis also entails that combination of *le* with a telic predicate as in (9) yields a past reading. As mentioned, no subpart of a telic eventuality is the same telic eventuality unless the subpart is the whole eventuality itself. The meaning of *le* in (17) thus entails that e' is e when e is a telic eventuality and e must be included within the topic time. This is equivalent to claiming that AspP has a perfective viewpoint. However, the topic time cannot be now, because a perfective viewpoint is associated with a null past tense by default. So, the topic time for a telic eventuality can only be some time interval in the past. Consequently, (9) can only have a past reading with the event described falling within a past time interval.

So far, the proposed analysis of the verbal *le* has produced a very good result for simplex sentences. What about those occurrences of *le* in subordinate clauses? Can the same analysis of *le* work? I would like to argue for a positive answer, though a

slight revision seems necessary. As a first step, consider the following sentences:

(20) Zhangsan shuo ta chi-le yi tiao yu

Zhangsan say he eat-Asp one Cl fish

‘Zhangsan said that he ate a fish.’

(21) Xiaozhang hui banfa jiangzhuang gei naxie xiangchu-le daan de ren

principal will give testimonial to those figure-out-Asp answer people

‘The principle will give a testimonial to those who have figured out the answer.’

(20) has a reading on which both the embedded and matrix events took place before the speech time and the embedded event precedes the matrix event. (21) is compatible with two situations. In one situation, the matrix event will take place in the future but the embedded event happened before the speech time. The other situation only requires that the embedded event precedes the future matrix event and hence the embedded event can also be located in the future. Such examples indicate that the meaning of *le* may involve some kind of relative anteriority. However, the original definition of the meaning of *le* as given in (17) allows no parameter to express the notion of relative anteriority. As a first step to accommodate examples like (20) and (21), let us first try to add a further condition on the topic time t_2 introduced by *le* such that t_2 must precede the run time of an event e_{pro} , which is intended to be a pronoun-like free variable. When this event variable is free, it is defined to refer to the utterance event. In this case, $\#(e_{pro})$, i.e., the run time of the utterance event, is equivalent to the speech time. However, e_{pro} can also be co-indexed with another event argument, giving rise to an anaphoric reading.^{vii} With the introduction of this pronoun-like event variable, a first attempt to accommodate examples like (20) and (21) might be something like (22i).

(22) Revised meaning of the verbal *le*

(i) $[[\mathbf{le}]] =: \lambda P \lambda t_2 \lambda e \exists e' [P(e) \wedge P(e') \wedge e' \leq_E e \wedge \tau(e') \subseteq t_2 \wedge t_2 < \tau(e_{pro})]$

(ii) $[[\mathbf{le}]] =: \lambda P \lambda t_2 \lambda e \exists e' [P(e) \wedge P(e') \wedge e' \leq_E e \wedge \tau(e') \subseteq t_2 \wedge t_2 \leq \tau(e_{pro})]$

Now consider (21) again. Because the addition of the condition “ $t_2 < \tau(e_{pro})$ ”, the topic time of the embedded clause must precede the run time of the speech event or the run time of the matrix event, depending upon whether e_{pro} is free or anaphoric. This accounts for why (21) is compatible with two different situations. When e_{pro} is free, the topic time of the embedded clause is required to precede the speech time. When e_{pro} is co-indexed with the matrix event argument, the topic time of the embedded clause needs to precede the matrix event.

As for (20), when e_{pro} is co-indexed with the matrix event argument, the reading that the embedded event precedes the matrix event is derived. However, when e_{pro} in (20) refers to the speech event, the embedded event is constrained to fall within a past interval but it says nothing about the relation between the embedded event and the matrix event. In principle, there are three possible relations between the embedded event and the matrix event, i.e., the embedded event precedes, follows or overlaps the matrix event. However, (20) has only the reading on which the embedded event precedes the matrix event. How is absence of the other two possible readings to be accounted for when e_{pro} is the speech event? Here is one possibility. Let us assume that indirect speech is transformed from direct speech by leaving out the quotations. Then the content of the indirect speech should match the content of direct speech. In Chinese direct speech, the progressive marker *zai* is required for an accomplishment to express an overlapping relation and the future marker *hui* ‘will’ is needed to express futurity (e.g., *Ta zai gai yi dong fangzi* ‘he is building a house; *ta hui gai yi dong fangzi* ‘He will build a house’). It follows from this that the embedded clause in (20) cannot express an overlapping or following relation, because the marker *zai* or *hui* is not there. Therefore, the only possible reading of (20) is the one where the embedded event precedes the matrix event when e_{pro} refers to the speech event. In other words, the reading on which e_{pro} refers to the speech event happens to coincide with the reading where e_{pro} refers to the matrix event. This is why no ambiguity can

be detected in (20).

Though the attempt given in (22i) works very well when the embedded clause is a telic sentence, it runs into problems when the embedded clause is atelic such as those sentences in (10). As mentioned, those sentences require that the run time of a subpart e' of the event e be included within the topic time, which is the speech time by default. This is why they have the present continuative reading. Now if the topic time is further constrained to precede the speech time, then a contradiction will arise because the speech time will be required to precede itself. Consequently, if the definition of (22i) were adopted, the original account for the present continuative reading of those examples in (10) would be lost. In order to maintain the original result, one might suggest that an equation symbol, intended to mean an overlapping relation, is added to make it possible for the topic time to precede or overlap the run time of e_{pro} . Thus, a second attempt to modify the semantics of the verbal le is something like (22ii), where the topic time of an event e is claimed to either precede or overlap the run time of e_{pro} .^{viii} On this analysis, when e_{pro} refers to the speech event, the run time of e_{pro} overlaps the default topic time now. Thus, the present continuative interpretation is maintained.

The revised semantics of le in (22ii) has a very nice consequence when examples like (10) are embedded to a verb. It predicts that when a sentence like those in (10) is embedded to a verb, a simultaneous reading can arise. For example, in (23), when e_{pro} is co-indexed with the matrix event argument, the topic time of the embedded event of raising a goldfish may overlap Zhangsan's saying time. It follows from this that the embedded event may be simultaneous with the matrix event. Indeed, this seems to be correct.

(23) Zhangsan shuo ta yang-le yi-tiao jinyu

Zhangsan say he raise-Asp one-Cl goldfish

‘Zhangsan said that he was/is raising a fish.’

If the topic time of the embedded clause with *le* can overlap the event time of the matrix clause, this predicts that when a telic sentence is embedded to a verb, it can have a temporal reading according to which the embedded event is included within an interval overlapping the matrix event. Is this prediction correct? (24) is a suggestive piece of evidence for a positive answer. Suppose that Zhangsan has uttered a sentence like (24a) and later this utterance is reported as an indirect speech as in (24b).

(24) a. Dao muqian weizhi wo yijing chi-le wu-tiao yu

to now until I already eat-Asp five-Cl fish

‘I have so far eaten five fishes.’

b. Zhangsan shuo dao ganggang weizhi ta yijing chi-le wu-tiao yu

Zhangsan say to just-now until he already eat-Asp five-Cl fish

‘Zhangsan said that until just now he had eaten five fishes.’

In (24b), the topic time of the embedded clause is some past interval whose final subinterval is just now. Since this final subinterval is arguably the same as the initial subinterval of the time of saying, an overlap relation can be claimed to exist between the time of saying and the topic time of the embedded clause. If this is correct, then the addition of the equation symbol to (22i) also makes a correct prediction for telic situations.^{ix}

Summarizing this section, following Xunning Liu’s (1988) idea, I have analyzed the verbal *le* as a realization operator and formally defined its meaning in terms of Bohnmeyer and Swift’s (2001) concept of event realization. This analysis requires

that an event e denoted by P is realized if and only if a subevent e' of e that also falls under P is included within the topic time. When P is telic, e' is equivalent to e , hence entailing that e is perfective. However, when P is atelic, e' can be a proper subpart of e or is equivalent to e . As a consequence, e is not necessarily included within the topic time and hence is not necessarily perfective. However, if the focus is only on the subpart e' of e , it still can be claimed that e' is perfective, because e' is included within the topic time. In this sense, if le is to be analyzed as a perfective marker as the traditional assumption holds, perfectivity can only apply to that subpart of event that is included within the topic time. If the focus is on the whole event, the aspectual viewpoint depends upon the aktionsart of VP. This analysis thus successfully accounts for the paradox of the perfective vs. imperfective viewpoint associated with le without running into a contradiction.

4.2 A Temporal Semantics of *Guo*

As discussed, unlike the verbal le , the temporal meaning of the experiential marker *guo* always expresses relative anteriority regardless of the aktionsart of the sentence containing it. In simplex sentences, *guo* requires that the event time precede the utterance time, whereas in complex sentences it requires that the event time of the subordinate clause containing *guo* precede the event time of the matrix clause or the speech time. Here are some examples illustrating occurrences of *guo* in a subordinate clause.

- (25) Ta mai-le yi-jian Daianna chuan-guo de yifu
 she buy-Asp one-Cl Diana wear-Asp Rel dress
 ‘She bought a dress that Diana had worn.’

(26) Wo renshi yi-ge chi-guo she de ren

I know one-Cl eat-Asp snake Rel man

‘I know a man who has eaten a snake.’

(27) Ta (jianglai) hui jia-gei yi-ge zai Harvard du-guo shu de ren

she in-the-future will marry-to one-Cl at Harvard study-Asp book Rel person

‘She will marry a man who (has) studied at Harvard.’

In (25), the event of wearing must precede the event of buying (cf. Li (1999)). (26) is compatible with two situations. It might describe a situation where the man that I know ate a snake at a time before I know him; that is, the embedded event precedes the matrix event. (26) can also be used to describe a situation where the event of snake eating took place at a time after I came to know the man. In this reading, the embedded event precedes the speech time but not the event time of the matrix clause. Finally, (27) is also compatible with two situations. In one situation, the embedded event occurred before the speech time. So (27) means that she will marry a man who has studied at Harvard. In the other situation, the embedded event of studying at Harvard takes place in the future but before the matrix event time of marriage.

To capture the fact that *guo* always expresses relative anteriority regardless of the aktionsart of the sentence, I propose that the temporal meaning of *guo* be defined as in (28), which says that when *guo* is combined with a property of events P , there exists an event e denoted by P and the running time of e is included within the topic time t_2 , which in turn precedes $\#(e_{pro})$.

(28) The temporal semantics of *guo*

$$[[\mathbf{guo}]] = \lambda P_{\langle s, t \rangle} \lambda t_2 \lambda e [P(e) \wedge \tau(e) \subseteq t_2 \wedge t_2 < \tau(e_{pro})]$$

When *guo* appears in a simplex sentence, e_{pro} in (28) is free and hence $\#(e_{pro})$ is equivalent to the speech time. This guarantees that any simplex sentence with *guo* has a past interpretation. On the other hand, if *guo* appears in a subordinate clause, it can be free or be co-indexed with the event argument of a higher clause. This explains why (26) and (27) are compatible with different situations. The reason why (25) does not have a reading where the event of wearing precedes the speech time but follows the matrix event might be due to pragmatics, which I will not further explore.

It is interesting, at this point, to compare the temporal semantics of *guo* with that of *le*. If we look at the meaning of *guo* in (28) and that of *le* in (22) carefully, it turns out that the proposed temporal semantics of *guo* only minimally differs from that of *le*. In essence, there are two differences between them. One difference is that while *guo* requires that the run time of the whole event is included within the topic time, *le* only requires that a subpart of an event is included within the topic time. The other difference is that while the topic time of a sentence containing *guo* strictly precedes the run time of the contextually determined e_{pro} , *le* additionally allows the topic time to overlap the run time of e_{pro} , depending upon the aktionsart. This result, of course, is not surprising, given that both *le* and *guo* have a past-tense like reading in many similar contexts.

The proposed analyses of *guo* and *le* also have something similar; namely, both seem to incorporate simultaneously the meaning of aspect, i.e., the relation between an event and its topic time, and the meaning of tense, i.e., the relation between topic time and a reference time. This result is very desirable, because it explains why some studies of *le* and *guo* have suggested that they are much like a relative past tense marker, though the traditional assumption has suggested that they are aspectual markers (cf. Lin (2000b)).

Before moving to next section, it is very helpful to the reader to clarify what

features of my analysis of the verbal *le* and *guo* differ from the previous analyses. The first important feature distinguishing my analysis from most of the other proposals in the literature is that instead of using descriptive terms that might sometimes be very vague, the proposal in this paper defines the temporal meanings of the verbal *le* and *guo* in a very formal and precise way. This not only enables us to see clearly how the verbal *le* and *guo* differ from each other in their temporal meanings but also explains straightforwardly why temporal interpretation of sentences with the verbal *le* is sensitive to aktionsart, whereas temporal interpretation of sentences with *guo* is not.^x Most of the references in the literature that have touched this issue are descriptive without a true explanation, but the analysis proposed in this paper explains it. A second distinguishing feature of my proposal is that both *le* and *guo* seem to have an aspectual component as well as a tense component. This explains why the verbal *le* and *guo* are like aspectual markers as well as relative tense markers. Finally, the proposed analysis employs a pronoun-like event (free) variable to formally capture the flexibility of the reference time of the verbal *le* and *guo* so that the reference time can be either the speech time or an event time in a higher clause. This formal mechanism renders it unnecessary to say that *le* and *guo* are ambiguous as in Li's (1999) descriptive work.

4.3. A Temporal Semantics of Sentence-final Le

In addition to appearing as a verbal suffix, *le* may also occur in the sentence-final position as illustrated in (29b). The distinction between the verbal *le* and the sentence-final *le* has been traditionally characterized as follows: The former describes perfectivity of a situation (Wang (1965); Chao (1968); Li and Thompson (1981); Magione and Li (1993)), whereas the latter signals inchoativity or change of state

(Teng (1975); Chan (1980); Zhu (1982)), current relevance or perfect (Li, Thompson and Thompson (1982); Mochizuki (2000)). Although several pieces of evidence have been adduced to support the two *le* distinction, it is not agreed by everyone that *le* as a verbal suffix and *le* as a sentence-final particle are two different *les*. For example, Shi (1990) has analyzed the two *les* as having the same meaning. In this paper, I will not go into the debate, so I will not review the relevant arguments. Instead, I will only explicate my own view of the sentence-final *le*. If the analysis to be proposed is correct, it implies that though the meanings of the two *les* are not completely alike, their core meaning is actually the same.

As a first step toward understanding the meaning of the sentence-final *le*, let us compare (29a), which has the verbal *le* with (29b), which has the sentence-final *le*.

(29) a. Zhangsan mai-le yi-bu xin che

Zhangsan buy-Asp one-Cl new car

‘Zhangsan bought a new car.’

b. Zhangsan mai yi-bu xin che le

Zhangsan buy one-Cl new car Le

‘Zhangsan has bought a new car.’

Looking at the above two sentences alone, it is very difficult to tell what exactly differentiates them in a very precise way. Both examples require that before the speech time the event of buying a car be completed. So at first sight the truth conditions for the two sentences in question seem to be the same. However, if the two sentences are put into a discourse, their different truth conditions will begin to emerge. Compare (30a) with (30b).

- (30) a. Zhangsan zuotian mai-le yi liang xin che, keshi jintian jiu ba chezi
 Zhangsan yesterday buy-Asp one Cl new car but today then BA car
 mai-gei-le bieren
 sell-to-Asp other-people
 ‘Zhangsan bought a new car yesterday, but he sold it to some other person
 today.’
- b. ?? Zhangsan zuotian mai yi-liang xin che le, keshi jintian jiu ba
 Zhangsan yesterday buy one-Cl new car Le but today then Ba
 chezi mai-gei-le bieren
 car sell-to-Asp other-people
 ‘Zhangsan bought a new car yesterday, but he sold it to some other person
 today.’

The above contrast indicates that the sentence-final *le* implies that the car that Zhangsan bought is still in his possession at the speech time, which makes the discourse in (30b) incoherent, but there is no such implication for the verbal *le*. In other words, the sentence-final *le* seems to require that the result state brought about by the buying event must still hold at the speech time.

Another example that points to the same direction is the contrast between (31a) and (31b).

- (31) a. Wo zai meiguo zhu-le ershi nian, cong mei tingshuo-guo zhe-zhong shi
 I in America live-Asp twenty year ever not hear-Asp this-kind thing
 ‘I (have) lived in America for 20 years and (have) never heard this kind of
 thing.’
- b. Wo zai meiguo zhu ershi nian le, cong-meitingshuo-guo zhe-zhong shi

I in America live twenty year Le ever not hear-Asp this kind thing
'I have lived in America for 20 years and have never heard this kind of thing.'

Intuitively, (31a) is compatible with a situation in which I still do or a situation in which I no longer live in America at the speech time, but (31b) is only compatible with a situation in which I still live in America at the moment of speech. In other words, (31b) implies that the state of my living in America still holds at the speech time.

For completeness sake, it is also interesting to compare (32) with (33). (32) is a progressive sentence, which is often claimed to describe a state. (33) consists of an activity predicate, which may describe an episode or a habitual property.

(32) Wo zai he kafei le

I Prog drink coffee Le

'I am (in the state of) drinking coffee now.'

(33) Wo he kafei le

I drink coffee Le

(i) 'I have had coffee.'

(ii) 'I now drink coffee, (though I didn't before).'

Although activities and progressive states are both atelic, they seem to give rise to different implications when they occur with the sentence-final *le*. When a sentence describes a (progressive) state, use of the sentence-final *le* requires that the (progressive) state still hold at the speech time. It is often claimed that such sentences have an inchoative interpretation. In contrast, when a sentence describes an activity, the activity can be terminated but its result state should hold at the speech time and is

relevant to the current situation. This interpretation somewhat resembles English present perfect according to which the main focus is current result state rather than the past event. The habitual or generic interpretation of activity predicates patterns with the behavior of (progressive) states in that the habitual generic state must hold at the speech time. This is not surprising, because just like progressive sentences, habitual or generic sentences are often claimed to be states, too.

The above discussion of the sentence-final *le* clearly suggests that its meaning involves some notion of result state. Although I will not be very explicit about the definition of result state, it seems quite reasonable to say that an event has an associated result state only when the event is over. In fact, the result state must immediately follow the event that brings it about. If this is correct, then the presence of the sentence-final *le* entails realization of the event that brings about the result state. What is more problematic is states. Do states have result states? The answer to this question seems to be not apparent at all and might differ from a person to another person. Despite this, I would like to assume that states have associated result states; namely, the result state of a state is the state itself. Given this assumption, a function RESULT can now be defined so that when it applies to an eventuality, it yields the result state of that eventuality. If the above discussions are all correct, the meaning of the sentence-final *le* can be defined in a way almost identical to the meaning of the verbal *le* except that an additional condition should be added to the effect that the result state overlaps the speech time. In other words, the meaning of the sentence-final *le* can be defined as in (34), where “RESULT(e)Os*” reads as “the result state of *e* overlaps the speech time”.

$$(34) [[\mathbf{le}]] = : \lambda P \lambda t_2 \lambda e \exists e' [P(e) \wedge P(e') \wedge e' \leq_E e \wedge \tau(e') \subseteq t_2 \wedge t_2 \leq \tau(e_{\text{pro}}) \wedge \text{RESULT}(e)\text{Os}^*]$$

The requirement that the result state overlaps the speech time explains why sentences with the sentence-final *le* have implication of current relevance as many linguists have observed.

A very good feature about the above approach to the sentence-final *le* is that it explains why the verbal *le* and the sentence-final *le* are so similar. Their meanings are very similar because they share the same core meaning, the only difference being that the sentence-final *le* has a condition on the result state that does not appear in the meaning of the verbal *le*. If this analysis is correct, this should contribute to the debate between the single-*le* analysis or the two-*le* analysis in the literature.

5. Temporal Reference of Complement Clauses of Verbs

Temporal reference of Chinese subordinate clauses has received very little attention in the literature. The only relevant reference that I know of is Li's (1999) book on Chinese tense. However, his examples are restricted to subordinate clauses with *zhe*, *le* and *guo*. Briefly speaking, his analysis of *zhe*, *le*, *guo* is as follows. When these aspectual markers appear in a simplex (or matrix) clause, their reference time is the speech time and their occurrences in these constructions should be taken as markers of absolute tenses. On the other hand, when they appear in a subordinate clause, their reference time is the event time of the matrix clause and they should be analyzed as markers of relative tenses. Though Li's analysis of *zhe*, *le*, *guo* is very inspiring^{xi}, its application is restricted to subordinate clauses with an aspectual marker. It does not say anything about those subordinate clauses without any aspectual marker. In this sense, his analysis is not general enough. In what follows, I will show that temporal reference of Chinese subordinate clauses is largely constrained by the lexical

semantics of the matrix verb and the constraint cannot be overruled by the use of an aspectual marker.

Different verb types may impose a different constraint on temporal locations of events denoted by complement clauses of verbs. Some verbs require that the event time of the subordinate clause follow that of the matrix clause, whereas some other verbs are the other way around. Still another type of verb requires that the event time of the subordinate clause overlap that of the matrix clause. There are also verbs that do not impose any constraint. Let us use e_1 to refer to the matrix clause event and e_2 the subordinate clause event. The different temporal relations between the matrix and embedded clauses are illustrated by the following examples.

(35) $e_1 < e_2$

Ta qiangpuo/jianyi wo kao daxue

he force/suggest I take-exam university

‘He forced me to/suggested that I take the entrance exam for colleges.’

(36) $e_1 \text{ O } e_2$

Wo kanjian ta da Lisi

I see he hit Lisi

‘I saw him hit Lisi.’

(37) $e_1 > e_2$

Ta hen houhui shuo huang

he very regret tell lie

‘He regrets having told lies.’

(38) $e_1 = e_2 =$ generic interpretation

Wo xihuan ta chuan duan-chun

I like she wear short-skirt

‘I like her wearing a short skirt.’

(39) No constraint on the relation between e_1 and e_2

a. Zhangsan shuo/renwei Lisi shuo huang $e_1 > e_2$

Zhangsan say/think Lisi tell lie

‘Zhangsan said/thinks that Lisi told lies.’

b. Zhangsan shuo/renwei ta zai xizao $e_1 O e_2$

Zhangsan say/think Lisi Prog take-a-bath

‘Zhangsan said/thinks Lisi was/is taking a bath.’

c. Zhangsan shuo/renwei Lisi hui chuli $e_1 < e_2$

Zhangsan say/think Lisi will handle

‘Zhangsan said/thinks Lisi would/will handle it.’

d. Zhangsan shuo/renwei Lisi xihuan bangqiu generic interpretation

Zhangsan say/think Lisi like basketball

‘Zhangsan said/thinks that Lisi likes basketball.’

Although no complement clauses of the matrix verbs in (35)-(38) contain any temporal adverbial or aspectual marker, they have a fixed temporal reference. How temporal location of events denoted by complement clauses is determined is the focus of this section. My idea is that it is basically determined by the inherent temporal relation that the matrix verb imposes upon the event argument of the matrix verb and that of the complement clause. Take (35) for example, the meaning of the verb *qiangpuo* ‘force’ can be defined in such a way that the embedded event follows the event of forcing or suggestion. Because the formal semantics of attitude reports or complement clauses is a very complicated issue, I will not go into the formal details. The reader is referred to Portner (1992) for some discussion which may account for the kind of constraints that I suggested above.

An important point about temporal reference of complement clauses is that the temporal constraint a matrix verb imposes upon its complement clause often leaves the temporal location of the embedded event underspecified. For example, by the tense selection of covert past tense, the matrix clause in (35) must be a past tense. However, to satisfy the requirement of “ $e_1 < e_2$ ” that the matrix verb imposes upon the complement clause, e_2 can be in the past or in the future as long as it does not precede e_1 . Thus, (35) is temporally underspecified. However, for some other verbs, the lexically specified temporal constraint directly determines the temporal location of the embedded event. For example, the verb *kanjian* ‘see’ requires that the embedded event overlap the matrix event of seeing.^{xii} Thus, if we know the event time of seeing, we will know the event time of the embedded clause. Moreover, this temporal relation cannot be affected by presence of an aspectual marker in the embedded clause. For example, though the Chinese sentence *Zhangsan kanjian Lisi chi-le yi-tiao she* ‘Zhangsan saw Lisi eat a snake’ has the verbal *le* embedded in the complement clause, the embedded event cannot precede the matrix event.

Finally, we have a class of verbs that do not impose a fixed temporal relation upon their complement clause such as those examples in (39). However, even for this type of verb, the event time of the matrix clause can still be related to temporal location of the embedded event in some way. Take (39c) for example. The embedded clause contains the modal auxiliary *hui* ‘will’. Therefore, the embedded clause has a future interpretation. Notice, however, that the future meaning of *hui* ‘will’ in (39c) is compatible with a situation in which the action of handling took place in the past or a situation in which it will take place in the future as long as the time of handling follows the time of saying. A natural account for this fact is to say that the event time of the matrix clause is the reference time of the modal auxiliary *hui* ‘will’. To capture this idea, I propose that the modal *hui* ‘will’ has the following denotation.

$$(40) [[\mathbf{hui}]] = : \lambda \wp_{\langle i, s, t \rangle} \lambda t_2 \lambda e [\tau(e_{\text{pro}}) < t_2 \wedge \wp(t_2)(e)]$$

Applying (40) to (39c), we can let the event of saying be the value of e_{pro} . It follows from this that the time of handling must follow the time of saying, because the time of following is included within the topic time t_2 . However, there are two possible situations to satisfy this requirement, depending upon whether the time of handling is located before the speech time or after the speech time. Indeed, (39c) is indeterminate in these two situations.

The case of (39b) is similar. The progressive marker provides an overlapping relation between the topic time and the matrix event time. As for (39a) and (39d), these two sentences do not have any aspectual marker or modal auxiliary. Therefore, there is no e_{pro} in these two cases and the event time of the embedded clause is not directly linked to the event time of the matrix clause. Instead, it seems that the embedded clauses are interpreted as if they were unembedded.

6. Temporal Reference of Relative Clauses

Like complement clauses of verbs, not enough attention has been paid to the problem of temporal reference of Chinese relative clauses, though they display many intriguing temporal properties. I start with a semantic difference between relative clauses and complement clauses of verbs. As noted, temporal reference of a complement clause is generally determined by the temporal relation they bear to the matrix verb. Unlike complement clauses, relative clauses are not arguments of verbs. Therefore, it is impossible for a matrix verb to impose a temporal restriction upon a relative clause directly. To illustrate, consider the following two examples.

(41) a. Ta mai-le Zhangsan xie de shu

he buy-Asp Zhangsan write Rel book

‘He bought a book/books that Zhangsan wrote.’

b. Mama na-zou-le wo nan-pengyou ji gei wo de xin

mother take-away-Asp my boy-friend send to me Rel letter

‘Mother took away letters/the letters that my boyfriend sent to me.’

Because the arguments of the verbs *mai* ‘buy’ and *na-zou* ‘take away’ in (41a) and (41b) are *shu* ‘book’ and *xin* ‘letter’, respectively, rather than *Zhangsan xie de* ‘which Zhangsan writes’ and *wo nanpengyou ji gei wo de* ‘which my boyfriend sends to me’, the verbs may not directly impose a temporal constraint on the relative clauses. Notice also that the relative clauses in (41) do not contain any time adverbial or aspectual marker. So temporal reference of these relative clauses cannot be attributed to time adverbials or aspectual markers. How is then their temporal reference determined?

One possible hypothesis is that temporal reference of relative clauses is determined by a higher clause that dominates it. We may refer to this hypothesis as Temporal Control Hypothesis (TCH). For instance, due to the use of *le* in (41a) and (41b), the event time of the matrix verb refers to a past interval and therefore the relative clause also has a past interpretation. (42a) and (42b), where the matrix clause contains a modal auxiliary indicating a future time, support the same hypothesis. According to TCH, the relative clauses in both (42a) and (42b) should have a future interpretation just like the matrix clauses. Indeed, one can felicitously utter (42a) and (42b) if the events denoted by the relative clauses take place in the future.

(42) a. Ta hui mai Zhangsan xie de shu ma

he will buy Zhangsan write Rel book Q

‘Will he buy books that Zhangsan wrote/will write?’

b. Mama hui na-zou wo nan-pengyou ji gei wo de xin

mother will take-away my boy-friend send to me Rel letter

‘Mother will take away the letter that my boy sent/will send to me.’

Notice, however, that (42a) and (42b) are also felicitous in a situation where the relative clauses are understood as referring to past events. Interestingly, the past interpretations of the relative clauses in (42a) and (42b) do not conform to the prediction made by the TCH.^{xiii} One way out of this problem is to say that the object NPs may optionally undergo quantifier raising (QR) (Montague (1974); Ogihara (1989, 1996); Stowell (1993)). Once an NP containing a relative clause has undergone QR, the relative clause will be outside the scope of the clause originally dominating it and hence its temporal interpretation is no longer dependent upon the dominating clause. Suppose we further assume that a relative clause not within the scope of the matrix clause receives its temporal interpretation as if it were unembedded, then we can get a past interpretation for the relative clauses in (42). Therefore, the past interpretations of (42a) and (42b) may not be a real obstacle to TCH.

Another example that might be used to support TCH is (43). In this example, the matrix verb is an individual level predicate that is inherently generic according to Chierchia (1995). Very interestingly, the relative clause *Zhangsan xie de* ‘which Zhangsan writes’ in this example has a generic reading, in addition to a past reading. That is, (43) can be construed as: I like any poem that *Zhangsan* writes at any time. Again, we see that the temporal reference of a relative clause seems to depend upon that of the matrix clause.

(43) Wo xihuan Zhangsan xie de shi

I like Zhangsan write Rel poem

‘I like poems that Zhangsan writes.’

Although TCH seems quite successful in accounting for the above data, it is not without problems. The first problem with TCH is that its application is at best restricted to relative clauses. For example, it does not predict that the embedded clauses in (44) and (45) must have a past interpretation even though the matrix clauses have a future and present interpretation, respectively.

(44) Ta yiding hui founen shi ta nazou wo de shu

he definitely will deny be he take-away I DE book

‘He will definitely deny that it was he that took away my book.’

(45) Zhangsan renwei Lisi shuo huang

Zhangsan think Lisi tell lie

‘Zhangsan thinks that Lisi told a lie.’

Notice that the past interpretation of the embedded clauses in (44) and (45) cannot be rescued in the same way as we did for the relative clauses in (42), because complement clauses are normally not analyzed as quantificational NPs and hence will not undergo QR. Likewise, as will be discussed later, the temporal interpretations of some adverbial clauses cannot be determined by that of the matrix clauses. Therefore, the applicability of TCH is not general enough or it hasn’t been stated right.

In addition to the problem of generality, TCH has empirical problems. In our above discussion, relative clauses are contained in NPs without a determiner. The addition of a determiner, however, may change the interpretation of a relative clause.

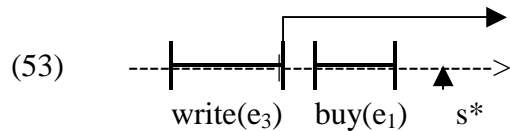
Compare (46a) and (46b) with (42b) and (43).

- (46) a. Mama hui na-zou wo nan-pengyou ji gei wo de na-feng xin
mother will take-away my boy-friend send to me Rel that-CL letter
'Mother will take away the letter that my boy friend sent to me.'
- b. Lisi xihuan Zhangsan xie de na-shou shi
Lisi like Zhangsan write Rel that-CL poem
'Lisi likes the poem that Zhangsan wrote.'

Unlike (42b) and (43), (46a) is not ambiguous between a future and past reading. With the addition of the demonstrative determiner *na-feng* 'that-CL', the future reading—the one predicted by TCH—disappears. Similarly, after the insertion of the demonstrative determiner *na-shou* 'that-CL', (46b) does not have a generic reading. Instead, the relative clause now only has a past reading. The examples in (46a) and (46b) clearly show that temporal reference of Chinese relative clauses is not a pure matter of temporal control. The reference of a determiner such as that of a demonstrative also matters.

Given the above problems, I would like to pursue another approach to temporal reference of relative clauses. To begin with, I want to make some comments on the semantics of bare nouns in Chinese. Chinese bare nouns may receive various interpretations depending upon the contexts in which they appear. Here are some examples.

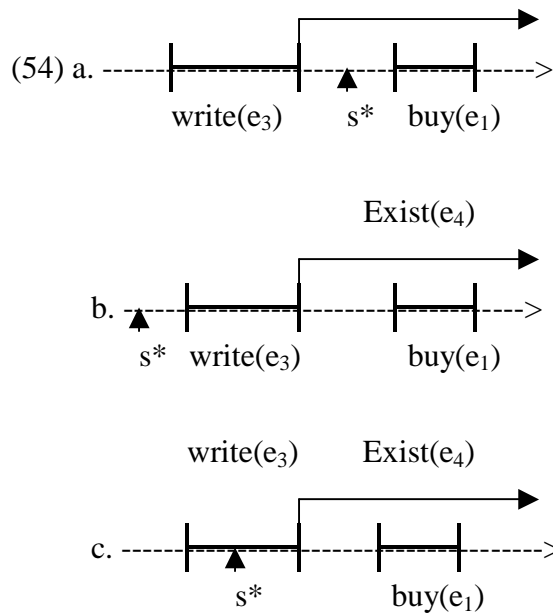
- (47) Wo mai-le shu (le) Existential or Definite Interpretation
I buy-Asp book Le
'I bought books/the book(s).'



From our previous discussion, it should be clear that the buying event must precede the speech time due to the use of the verbal *le*. Now if the buying event must be included within the run time of the existence predicate, the life span of the book, then the book must have already existed before the speech time. It follows that the writing event must precede the speech time as well, because the writing event must precede the existence of the book. Therefore, the relative clause in (41a) has a past interpretation.

Next, let us reconsider (42a), which differs from (41a) in having a future modal auxiliary in the matrix clause instead of the verbal *le*. Due to the use of the modal *hui* ‘will’ in the matrix clause, the buying event must follow the speech time. Moreover, the run time of the buying event must be included within the life span of the book. To satisfy these two conditions, however, there are three possibilities as shown in (54). The first possibility is that the writing event begins and ends before the speech time but the buying event is located after the speech time. Another possibility is that the writing event and the buying event are both located in the future. Finally, the writing event might begin before the speech time, continue to the future and end in the future but before the buying event. In all these three possibilities, the writing event must end before the buying event or the inclusion condition “ $\tau(e_1) \subseteq \tau(e_4)$ ”, i.e., the run time of the buying event is included within the life span of the book, will not be satisfied. The three possibilities are represented as follows.

Exist(e_4)



These three different possibilities predict that (42a) is compatible with a situation where the writing event denoted by the relative clause takes place in the past, in the future or is on-going. Indeed, (42a) can be used in all of the above three situations.

The reading represented by (54c) is worth particular mentioning here. This reading is a great problem with TCH, because neither TCH nor quantifier raising predicts this reading.

Another important point related to my above discussion brought to my attention by Barbara H. Partee has to do with example (55).

(55) Zhangsan hui mai san ben Lisi xie de shu

Zhangsan will buy three CL Lisi write Rel book

‘Zhangsan will buy three books that Lisi wrote/is writing/will write.’

What is interesting about this example is that it can be true in a situation where the writing time of each of the three books is different. In particular, (55) can be true in a situation where Zhangsan will buy one book which Lisi wrote before the speech time,

another book which Lisi is writing at the speech time and the third book which Lisi will write in the future. In fact, (42a) can be true in a similar situation with different books written at different times. This indicates that the three possibilities described in (54) are not a tense ambiguity at all. They only reflect an indeterminate temporal interpretation. If this is correct, it strongly implies that tenses do not exist in Chinese, at least not in relative Clauses, because it is impossible for a single tense to mean past, present and future at the same time, if generic interpretation is put aside.

Next, let us reconsider (43), reproduced below as (56). Recall that this example seems to constitute a piece of evidence in support of TCH. In what follows, I will show that it is not necessary to resort to TCH to explain the generic reading of the relative clause in (56). The generic reading can be derived from a device independently needed by universal grammar.

(56) Wo xihuan Zhangsan xie de shi

I like Zhangsan write Rel poem

‘I like poems that Zhangsan writes.’

To begin with, I assume Chierchia’s (1995) treatment of individual level predicates as generic polarity items, which are licensed by a Gen operator. The Gen operator is like an adverb of quantification in that it will partition the clause containing it into restriction and scope and can freely bind any free variable. Moreover, when there is no overt restriction on individual level predicates, a general locative relation represented by **in** is the restriction. Take (57a) for example. It translates as (57b) on Chierchia’s analysis. In plain English, what (57b) says is that whenever John is or might be located, he knows Latin.

(57) a. John knows Latin.

b. Gen s [in'(j,s)][know'(j,L,s)]

The second assumption that I will be assuming is that bare plurals, like indefinites with the form 'a + N', may introduce free variables bound by an adverb of quantification (Wilkinson (1991)). Therefore, a sentence such as (58a) may get a logical form like (58b) under Chierchia's analysis.

(58) a. John likes poems.

b. Gen x,s [poem'(x) ∧ in'(j,s) ∧ in'(x,s)][Like'(j,x,s)]

Since the Gen operator induces universal readings for the variable x, so the bare plural *poems* in (58) has a universal force.

Returning to the Chinese example (56), I assume that Chinese bare nouns may introduce free variables just as English bare plurals. Since the interpretation of an NP of the form 'relative clause + bare noun' is similar to a bare noun, it may introduce a free variable just like a normal bare noun except that the variable introduced has an additional predicate contributed by the relative clause to restrict it. On the above assumptions, (56) can be analyzed as follows. Suppose that in addition to the **in** restriction, the Gen operator for (56) also selects the object NP as its restriction. Then, the relative clause contained in the object NP will become part of the restriction, because it is syntactically part of the object NP. Thus, the logical form of (56) should be something like (59).

(59) Gen_{x,s} [poem'(x) ∧ ∃_{s'}[write'(Z,x,s')] ∧ in'(Z,s) ∧ in'(x,s)][like'(I',x,s)]

Just like (58), the Gen operator in (59) binds the variables x and s . However, in addition to this, I assume that the situation variable s' introduced by the relative clause is existentially closed by existential closure. Given that the Gen operator is roughly equivalent to a universal quantifier, the meaning of (59) is thus something like the following: For any poem x in a situation s where both the poem and I are located, there is an extended situation s' in which Zhangsan writes the poem and I like the poem in situation s . Because the existentially closed situation variable s' of the predicate *xie* 'write' is embedded within the scope of the generic operator and a narrow scope existential quantifier is equivalent to a wide scope universal quantifier, we get a generic interpretation for the relative clause. On this analysis, the fact that the relative clause in (55) has a generic reading is nothing but a side effect of the object NP being quantified over by the Gen operator.

Now recall that when an extra demonstrative determiner such as *na* 'that' is added to modify the head noun of the object NP in (56), the relative clause must be understood as having a past reading instead of a generic reading. The relevant example is reproduced here.

(60) Wo xihuan Zhangsan xie de na-shou shi

I like Zhangsan write Rel that-Cl poem

'I like the poem that Zhangsan wrote.'

Why does the relative clause in (60) have a past reading? The answer seems to have to do with the semantics of the demonstrative determiner *na* 'that'. When *na* 'that' is combined with a common noun, it implies existence of an individual satisfying the description of the common noun. Such a property is known as existence presupposition of definite descriptions in the literature (Heim (1982)). Applying this

property to the definite description *Zhangsan xie de na-shou shi* ‘that poem that Zhangsan wrote’ in (60), this means that there must exist an individual that satisfies both the property of being a poem and the property of being written by Zhangsan. If a poem has already existed and is the product of Zhangsan’s writing, then the writing event must have taken place before the speech time, because verbs of creation such as *write* has an end product only when the event described by the verb is completed. I conclude that the past interpretation of the relative clause in (60) is an inference deriving from the existence presupposition and the verbal semantics of the verb *xie* ‘write’. If this is correct, then there is no need to postulate a tense node in a relative clause.

Another interesting property relevant to temporal reference of a relative clause is the life time effect of a proper noun (or a definite NP). Usually when a speaker mentions a proper name, he assumes that the referent denoted by it is alive. However, in some cases, the referent of a proper name may be already dead at the speech time. The lifetime of a proper name has a deciding influence on the interpretation of its containing clause. For example, (61) below is completely the same as (56) except for the subject NP of the relative clause. However, since Lipai, a poet who lived in Tang Dynasty, is a dead man and can no longer write poems at the utterance time, the relative clause in (61) must be understood as about the past.

(61) Wo xihuan Lipai xie de shi

I like Lipai write Rel poem

‘I like poems that Lipai wrote.’

(61), again, points to the conclusion that temporal reference of Chinese relative clauses is not a pure matter of temporal control but involves many other factors such

as the semantics of bare nouns, the semantics of verbs, referential properties of demonstratives and even our world knowledge about the history, which is not linguistic form at all. All of these suggest that temporal interpretation of a relative clause does not depend upon existence of a tense node in phrase structure.

7. Temporal Reference of Adverbial Clauses

In this section, I will discuss temporal reference of temporal adverbial clauses as illustrated by (62)-(64).

(62) a. Ta lai de-shihou, wo hui gaosu ta

he come when I will tell him

‘When he comes, I will tell him.’

b. Wo zhu zai meiguo de-shihou, chi-guo longxia

I live in America when eat-Asp lobster

‘When I lived in America, I ate lobsters (I had the experience of eating lobsters).’

c. Ta lai de-shihou, wo (zheng) zai zhu fan

he come when I right Prog cook rice

‘When he came, I was cooking.’

(63) a. Wo qu zhiqian, (wo) hui xian da dianhua gei ni

I go before I will first make phone-call to you

‘Before I go, I will call you first.’

b. Wo qu zhiqian, da-guo yi-tong dianhua gei ta

I go before make-Asp one-Cl phone-call to him

‘Before I went, I made a phone call to him.’

c. Ta lai meiguo zhiqian, shi ge yanyuan

he come America before be Cl actor

‘Before he came to America, he was an actor.’

(64) a. Wo kaoshang yanjiusuo yihou, hui mai yi-liang xin che

I admitted graduate-school after will buy one-Cl new car

‘After I am admitted to a graduate school, I will buy a new car.’

b. Wo kaoshang yanjiusuo yihou, mai-le yi liang xin che

I admitted graduate-school after buy-Asp one-Cl new car

‘After I was admitted to a graduate school, I bought a new car.’

c. Kao-wan shi yihou, ta-de xinqing hen qingsong^{xvi}

examine-finish test after his mood very relaxed

‘After he finished the test, he was very relaxed.’

The subordinate clauses in (62)-(64) contain neither an aspectual marker nor a temporal adverbial, but they all have a fixed temporal reference just as the matrix clauses do. To put the (c) examples aside for the moment, the (a) and (b) examples seem to indicate that temporal reference of a temporal adverbial clause can be determined by that of the matrix clause. For example, the matrix clauses in the (a) examples have a future interpretation because of the use of the modal auxiliary *hui* ‘will’ and so do the adverbial clauses. Similarly, both the matrix and embedded clauses of the (b) examples receive the same past interpretation because of the use of *le* or *guo* in the matrix clauses. If we look at these two sets of examples alone, it seems very tempting again to suggest that a control theory--for example, something like the TCH mentioned in the last section, may account for temporal reference of Chinese temporal adverbial clauses. That is, one first determines the temporal reference of the matrix clause as if the adverbial clause did not exist and then assigns

the same temporal value to the adverbial clause. Plausible as the above control theory might sound, it is not general enough to cover the (c) examples in (62)-(64). An important difference between the (a), (b) examples and the (c) examples in (62)-(64) is that the matrix clauses of the (a), (b) examples describe telic events, whereas the matrix clauses in the (c) examples describe atelic states. As discussed, an atelic imperfective sentence without any temporal adverbial or tense-aspectual marker must be assigned a present reading. Thus, according to the control hypothesis, the matrix clauses in the (c) examples should have a present interpretation, if we pretend that the temporal adverbial clause is not there. As a consequence, the control hypothesis predicts that the temporal adverbial clauses in the (c) examples in (62)-(64) have a present interpretation. However, this prediction is wrong, because the matrix and embedded clauses in (62)-(64) are asserted to be true of a past interval only. They do not assert that the matrix clauses are true of the speech time at all. This clearly indicates that temporal reference of Chinese temporal adverbial clauses must be determined by something other than the simple but incorrect control hypothesis such as the TCH. In what follows, I will pursue a different approach to account for the data in (62)-(64).

From (62)-(64), we have learned that temporal reference of a Chinese temporal adverbial clause varies with the context in which it appears. For the sake of argumentation, let us assume that any temporal interpretation can be assigned to a temporal adverbial clause but the assignment is subject to certain semantics or pragmatics constraints to be discussed later. Moreover, let us also assume that just as the tense node—if it exists—must agree with the interval denoted by *zuotian* ‘yesterday’ or *1996 nian* ‘the year of 1996’ as noted earlier, the tense node of the matrix clause in (62)-(64) must agree with the topic time introduced by the temporal adverbial clause. In addition, each temporal connective specifies a temporal relation

of precedence or overlap between the adverbial clause and the matrix clause. I will argue that the above assumptions, together with some other semantics or pragmatics constraints to be discussed later, will enable us to account for the temporal interpretation of Chinese temporal adverbial clauses.

To begin with, let us consider (62a). The temporal connective *de-shihou* ‘when’ dictates that the event time of the matrix clause overlaps or begins right after the event time of the adverbial clause (Partee (1984)). Moreover, the tense of the matrix clause—if it exists, must agree with the topic time introduced by *ta lai de-shihou* ‘when he come’, i.e., the interval at which he is here holds. Since the matrix clause in (62a) contains the modal auxiliary *hui* ‘will’, which can be assumed to occupy the tense node, the topic time should refer to a future time. Consequently, the adverbial clause must refer to a future time. The overlapping or right-after requirement introduced by *de-shihou* then forces the adverbial clause to refer to a future time just as the matrix clause. This explains why the temporal adverbial clause in (62a) has a future interpretation.

Similar remarks apply to (62b). Due to the use of the experiential marker *guo*, the matrix clause has a past interpretation. So the topic time is a past interval. It follows from the overlapping or right-after requirement that the temporal adverbial clause is about the past, too.

(62c) is more complicated. The matrix clause in this example does not contain any aspectual marker or modal auxiliary. This means that no direct evidence can tell us what temporal interpretation the matrix clause has. Notice that even though the tense, of the matrix clause—if it exists, must agree with the topic time introduced by the temporal adverbial clause, the temporal adverbial clause does not provide us with sufficient information to tell what its temporal interpretation is. It is thus mysterious how the temporal locations of the matrix and temporal adverbial clauses in (62c) is

determined. For the sake of argument, let us pretend that the temporal location of the temporal adverbial clause can be about the present or the future and see what violation the temporal specification might encounter. Consider present interpretation first. This temporal interpretation is not allowed for two reasons. The first reason has to do with Kamp and Reyle's (1993) observation about temporal prepositional phrases such as *in April* or *on Sunday*. They point out that these phrases cannot be used to refer to periods containing the utterance time. Thus, if today is Sunday and you know this, then you cannot utter the following sentence.

(65) Mary wrote the letter on Sunday.

They propose that this constraint be analyzed as a presupposition on the interpretation of such phrases. With this in mind, now let us consider the following Chinese sentences.

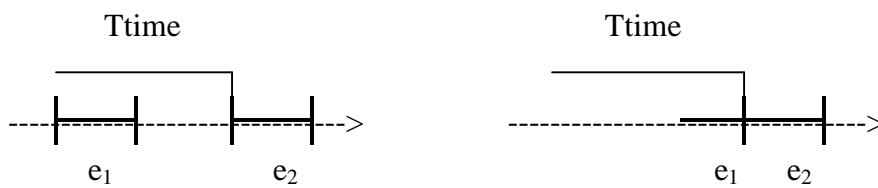
(66) Zhongqiujie de-shihou, wo jian-guo ta
moon-festival when I see-Asp him
'I saw him on the day of Chinese moon festival.'

The phrase *zhongqiujie de-shihou* 'the day of Chinese moon festival' exhibits properties similar to those of temporal expressions such as *in April* or *on Sunday*. If today is moon festival and you know this, you cannot felicitously utter (66). This fact suggests that *de-shihou* 'when' is subject to a constraint similar to *in April* and *on Sunday*. If this is correct, then the temporal location of the event denoted by the adverbial clause in (62c) cannot be about the present. The second reason is related to Maxim of Quantity, a conversation principle formulated by Grice (1975), which

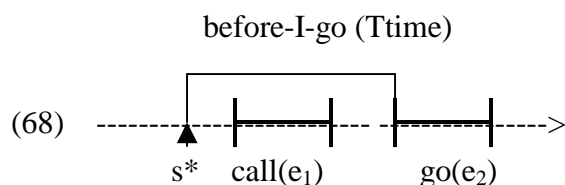
recommends speakers to say as much as he can. According to this maxim, if a speaker is cooking at the speech time, he should say it as such. In other words, if the speaker wants to use a time adverb to indicate the present moment, he should use expressions such as *xianzai* ‘now’ rather than a temporal adverbial clause that has no fixed temporal reference.

Next let us consider the examples in (63), involving the temporal connective *zhiqian* ‘before’. This temporal connective requires that the event denoted by the matrix clause, indicated by e_1 , precede the event denoted by the temporal adverbial clause, indicated by e_2 . Moreover, the whole temporal adverbial clause introduces an interval, i.e., the period of time before the event described by the *zhiqian*-clause ‘before-clause’, to serve as the topic time of the matrix clause. I use Ttime to stand for it. The time schemata for sentences containing a *zhiqian*-clause look like the following:

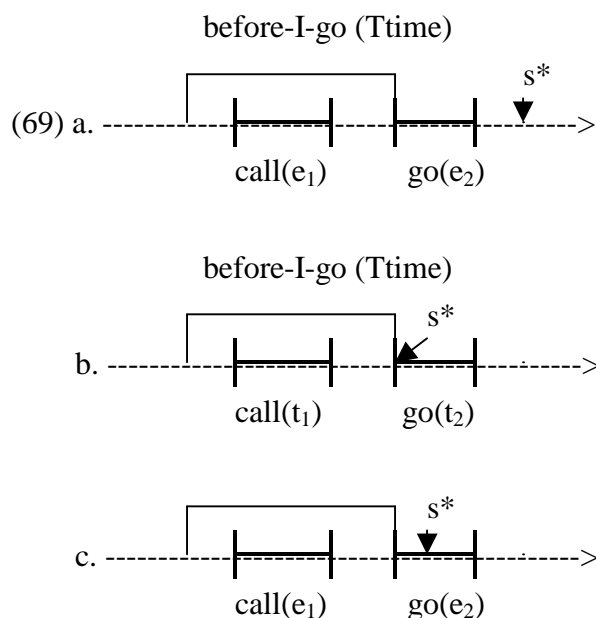
(67) Matrix clause telic (perfective) Matrix clause atelic (imperfective)



Now let us consider (63a). Due to the use of the modal auxiliary *hui* ‘will’, the matrix clause refers to a future event. In other words, e_1 in (67) must follow the speech time. Since the adverbial clause event e_2 follows the matrix clause event e_1 , e_2 must follow the speech time, too. This explains why the adverbial clause in (63a) has a future interpretation as the diagram in (68) indicates.



Next, let us consider (63b). In (63b), the experiential marker *guo* appears in the matrix clause. Therefore, the matrix clause has a past reading and the topic time must be about a past interval. To satisfy these requirements, however, there are three possibilities, as given in (69). In these diagrams, the topic time and the calling event are both before the speech time, but the location of the going event differs. In (69a), the time of going is before the speech time; in (69b), the time of going is in the future; in (69c), the going event overlaps the speech time.



According to (69a), (63b) should have a reading according to which both the calling event and the going event happened before the speech time. Indeed, (63b) has this reading. In contrast, (69b) and (69c) require that the calling event happen before the speech time but the going event will take place in the future or is on-going at the speech time. Unfortunately, these are readings that (63b) lacks. The problem is why

(63b) does not have these readings. In what follows, I will argue that the representation of (69b) and (69c) is ruled out by an independent principle proposed by Kamp and Reyle (1993).

Kamp and Reyle (1993) have made a very interesting observation about the combinations of tenses in main and subordinate clauses in English. They point out that English sentences like the following are deviant.

(70) Bill will leave before Mary arrived.

(71) Bill left before Mary will arrive.

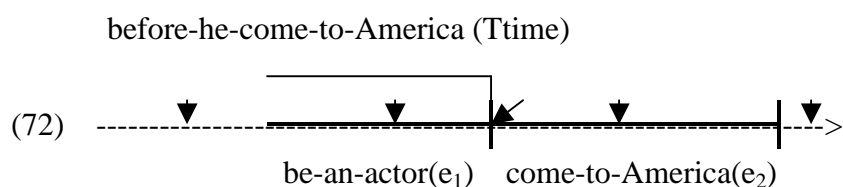
According to Kamp and Reyle (1993, 652), the oddity of (70) can be easily accounted for in terms of inconsistency because the word *before* requires that the event of the matrix clause precede the event of the subordinate clause but the tenses express the reverse. However, the same inconsistency account cannot be extended to (71), because a past event is certain to precede a future event. Despite this, they point out that what (70) and (71) have in common is that “their locating adverbs fail to produce a genuine constraint on the set of times compatible with the interpretation of tense”. Thus, they propose a “non-triviality constraint” to capture this. This constraint essentially says that “temporal adverbs must impose a genuine restriction on the location time”. This requirement is not satisfied in (71) because a past time is always before a future time. So there is no genuine constraint on the tenses and the meaning of *before*.

Although Chinese does not have morphological tenses, the situation in (69b) is completely parallel to that in (70) and (71). Thus, I suggest that Kamp and Reyle’s Non-triviality Constraint not be taken as a constraint on morphological tenses but a universal principle on permissible temporal interpretations for temporal connectives.

This then excludes the possibility of representing (63b) as (69b).

(69c) has a similar problem as (69b). As an event happened before the speech time is certain to precede an event that is taking place at the speech time, a diagram like (69c) cannot constitute a case where the temporal relation between the matrix and embedded clauses is genuinely constrained by the temporal connective *zhiqian* ‘before.’

The last example in (63) is (63c). (63c) is much like (62c) in that the matrix clauses in both sentences do not contain any aspectual marker or modal auxiliary. (72) is the diagram that indicates all possible locations of the speech time. In this diagram, five possible locations for the speech time are indicated by an arrow on the time axis.

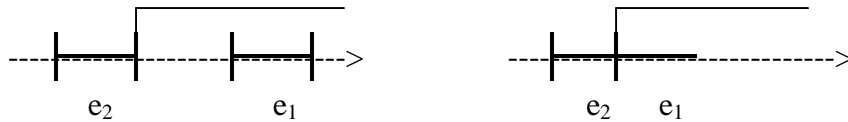


If the speech time is the leftmost arrow, then both the event of coming to America and the state of being an actor should hold at a future time. In other words, both the matrix and adverbial clause have a future interpretation. This is not permitted, however. As noted earlier, if a matrix clause is to express futurity in Chinese, an overt modal auxiliary or temporal adverbial indicating a future time is obligatory. However, (63c) does not contain a modal auxiliary such as *hui* ‘will’ or any time adverb such as *weilai* ‘in the future’ clearly indicating a future time. Though the adverbial clause *ta lai meiguo zhiqian* ‘before he come to America’ is a temporal adverbial, it is not that kind of temporal adverbial that inherently refers to a future time. Next, let us consider the second possibility, where the speech time is included within e_1 . This possibility means that the state of being an actor is asserted to be true at the speech time. But if this is

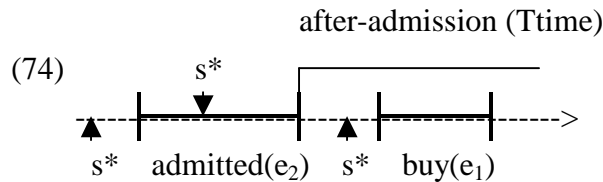
the assertion that the speaker wants to make, he should use a more direct expression such as *xianzai* ‘now’ to indicate this rather than using the temporal adverbial clause *ta lai meiguo zhiqian* ‘before he come to America’, which as noted does not have a fixed temporal reference. In other words, if the speech time falls within e_1 , the use of the construction in (63c) violates Grice’s (1975) Maxium of Quantity. As for the third possibility, it requires that the event of going to America take place in the future but the state of being an actor be true of a past interval. This possibility should be equivalent to the English sentence *He was an actor before he will come to America*. However, I have shown that the semantics of such sentences violates Kamp and Reyle’s (1993) Non-triviality Constraint. As for the fourth, it is excluded because the speech time can never be included within a telic (perfective) situation. The remaining possibility is the last arrow. In this possibility, both the state of being an actor and the event of coming to America precede the speech time. Since both events happened before the speech time, their temporal relation can be genuinely constrained by the semantics of the subordinator *zhiqian* ‘before’. Indeed, this is the only interpretation that does not violate any temporal constraint. Therefore, (63c) can be uttered in a situation where the last arrow is the utterance time. It follows from this that both the matrix clause and the adverbial clause have a past interpretation.

Finally, let us consider temporal reference of *yihou*-clauses ‘after-clauses’ in (64). The temporal connective *yihou* ‘after’ requires that the event described by the adverbial clause precede the event described by the matrix clause. So, the time schemata of sentences containing a *yihou*-clause should look something like those in (73).

(73) Matrix clause telic (perfective)	Matrix clause atelic (imperfective)
Ttime	Ttime



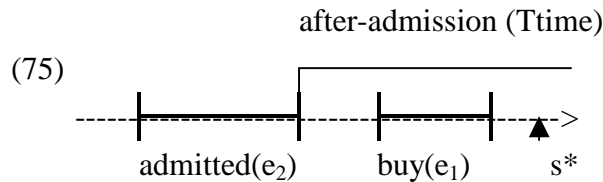
Applying the above schemata to (64a), we obtain the following diagram:



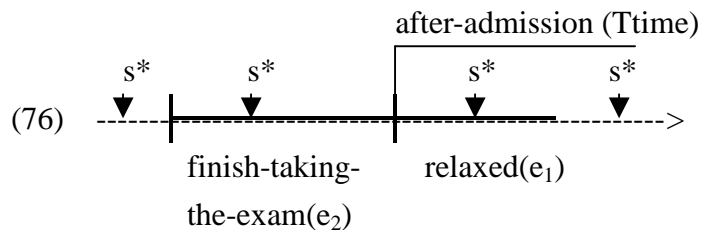
Because the matrix clause in (64a) contains the future modal auxiliary *hui* ‘will’, the event denoted by it must take place in the future. To satisfy this requirement, there are three possibilities: the speech time may follow the event of admission but precede the event of buying, or the speech time precedes both the event of admission and the event of buying, or the speech time overlaps the time of admission. However, the first option violates Kamp and Reyle’s Non-triviality Constraint, because a time before the speech time always precedes a time after the speech time. Therefore, there is no genuine constraint imposed by the time connective *yihou* ‘after’ in the first option. The third possibility is excluded because it is impossible for the speech time to be included within the run time of an achievement. An achievement situation must culminate before one is able to talk about it, unless it is about a future event. However, if the speech time precedes both events, i.e., the third arrow, no violation of Non-triviality Constraint will arise. This explains why the adverbial clause in (64a) has a future interpretation just like the matrix clause.

Next, consider (64b), which differs from (64a) only in the use of a different aspectual marker in the matrix clause. The use of *le* in (64b) indicates that the matrix clause is about a past event. Therefore, the event denoted by the matrix clause should

take place before the speech time. Since the semantics of *yihou* ‘after’ dictates that the event denoted by the *yihou*-clause precedes the event denoted by the matrix clause, it follows that the former also precedes the speech time. This is shown by the diagram in (75).



The last case is (64c). The matrix clause of (64c) is unbounded, so it should have a diagram like (76).



In this diagram, we have four possible speech times to consider. If the speech time is the leftmost arrow, this means that both the matrix clause and the adverbial clause have a future interpretation. This possibility is excluded, because future interpretation in Chinese requires an overt expression indicating a future time but no such expression is available in the structure. The temporal adverbial clause does not inherently refer to a future time, so it does not count as an expression indicating a future time. The second possibility has a similar problem, because it requires that the matrix clause be interpreted as a future clause but there is no overt expression inherently referring to a future time. In addition, achievement events denoted by sentences with a resultative verb such as *kao-wan* ‘finish examing’ can never include

the utterance time. The remaining possibilities are the third and the fourth arrows. The third possibility is excluded by Kamp and Reyle's Non-triviality Constraint, because an on-going situation always precedes a past situation. Finally, the fourth possibility claims that both the event of exam taking and the state of being relaxed happened in the past. Since two past situations can be genuinely constrained by a temporal connective, the fourth possibility does not violate Kamp and Reyle's Nontriviality Constraint or any constraint I discussed earlier. This predicts that the matrix and embedded clauses in (64c) should have a past interpretation.

Summarizing, just like relative clauses, the temporal interpretations of temporal adverbial clause do not constitute evidence of TP projection in Chinese, because they do not really need to make reference to tenses to determine event locations. Instead, they use inference rules plus pragmatics principles such as Grice's Maximum of Quantity or independently motivated non-triviality constraint on temporal connectives to determine temporal locations of events denoted by temporal adverbial clauses.

8. Temporal Adverbial Clauses with a Fixed Temporal Reference

We saw in the last section that *de-shihou* 'when', *yiqian* 'before', and *yihou* 'after' each specify a different temporal relation between the matrix clause and the temporal adverbial clause they introduce. However, as mentioned, though such temporal relations help resolve temporal reference, they do not directly specify what temporal location the event denoted by the adverbial clauses must have. Interestingly, unlike *de-shihou* 'when', *zhiqian* 'before' and *yihou* 'after', the temporal connective *zicong...yihou* 'since' lexically specifies the temporal location of the clause it introduces.^{xvii} Consider the following two examples. The matrix clause of (77) is stative, whereas that of (78) is eventive.

(77) Zicong he-le na-bei cha yihou, wo duzi jiu hen bu-shufu

Since drink-Asp that-Cl tea after my stomach then very uncomfortable

‘Since I drank that cup of tea, my stomach has been very uncomfortable.’

(78) Zicong gen mali chaojia yihou, Lisi jiu ban chuqu zhu le

since with Mary quarrel after Lisi then move out live Le

‘Since Lisi had a quarrel with him, he has moved out to live.’

As the above translations indicate, the clause introduced by *zicong...yihou* ‘since’ must denote a past event. The temporal meaning of (77) is thus something like: An event of my drinking that cup of tea occurred before the speech time and for a time interval beginning right after the event up to the utterance time, my stomach is uncomfortable at every subinterval of that interval, i.e., a universal reading. As for (78), its temporal meaning is something like: An event of Lisi having a quarrel with Mary occurred before the speech time and for a time interval beginning right after that event up to the utterance time, an event of Lisi moving out occurred at some time within that interval, i.e., an existential reading. In other words, the temporal connective *zicong...yihou* requires that the event denoted by the *zicong*-clause take place before the speech time and the *zicong*-clause contribute a topic interval that begins right after the culmination point of that past event up to the utterance time. The above informal description of the semantics of *zicong...yihou* ‘since’ can be formally captured by the definition of *zicong...yihou* in (79). In (79), $t > \langle t(e) \rangle$ means that t abuts the run time of the event e and $FINAL(t) = s^*$ means that the final point of the interval t is the speech time. In other words, t is the topic interval introduced by the *zicong*-clause. An illustration of how (79) works is shown in (80), which is the semantic computation for (78). In (80), I ignore all irrelevant details.

examples like (77) and (78), there is no strong evidence for existence of TP.

9. Conclusion

In his book *Hanyu Yufaxue* 'Chinese Grammar', Professor Fuyi Xing (1996), a traditional Chinese linguist, has pointed out that though research of Chinese grammar has made a great progress in the past decade, Chinese linguistics is still far away from being mature in that many linguistic facts have not been really brought to light and many important phenomena have not been accurately accounted for. Therefore two main interrelated issues that research of Chinese grammar faces nowadays are (i) to make clear what the facts are and (ii) to construct theories that may accurately account for those linguistic facts. I agree with professor Xing. Without a clear understanding of what the facts are, theory construction and methodology renovation are simply an impossible task and without construction of theories, it is impossible for a discipline to become mature. Indeed, what I have tried to do in this paper is to help achieve these two goals with respect to temporal reference in Chinese. On the one hand, I have described as many temporal phenomena as I can and as deep as possible. In fact, many of the facts discussed in this paper are described even for the first time in the literature. Of course, there are still many other interesting temporal phenomena that are not covered due to space limit, but I believe that the examples discussed in this paper are those that any temporal theory of Chinese sentences has to account for. On the other hand, I have attempted to account for the facts within a framework of model-theoretic semantics when it is possible. This approach to temporal reference of Chinese, I believe, is the best candidate that meets professor Xing's requirement of accuracy. However, I have to admit that though logical semantics is very precise, it is not all there is for temporal reference in Chinese. As I have shown in the text,

temporal reference of many Chinese sentences seem to be determined by individual verbal semantics, inference rules, independently motivated pragmatics or semantics constraints, semantics of noun phrases or even world knowledge, etc. This indicates that tenses, hence the TP projection, might not exist in Chinese at all, contrary to what many syntacticians have assumed. Although my discussion of Chinese temporal reference might not be perfect in every respect, I hope that the examples discussed and the proposed analyses will shed some new light for a future study of temporal reference in Chinese and for a comparative study of temporal reference across languages.

Notes

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ⁱ Klein's (1994) original definitions of perfective and imperfective aspect are more complicated than what is stated here. For the purpose of this paper, a simpler definition will suffice. Also notice that Kamp and Reyle (1993, 513-514) give evidence that the time at which a state holds and the topic time might involve an overlap instead of inclusion relation. I refer the reader to them for evidence. For the purpose of this paper, the inclusion relation is used when no confusion arises.

ⁱⁱ I assume with Heim and Kratzer (1998) that the index of a moved constituent serves as a lambda abstractor. This is why the semantics of AgrsP involves a lambda abstraction over the subject variable.

ⁱⁱⁱ The content of this section is adapted with a slight revision from Lin (2002). I refer the reader to that article for an application of the proposed analysis to a wider range of data.

^{iv} Bohnemeyer and Swift's paper is downloadable from the following web site:
http://www-uilots.let.uu.nl/conferences/Perspectives_on_Aspect/Proceedings/bohnemeyer.pdf.

^v Interestingly, (10a-c) are actually incompatible with the progressive marker *zai*.

^{vi} Barbara Partee and Angelika Kratzer (personal communication) have pointed out to me that the English verb *raise* is (or can be) a telic predicate, because it implicates attainment of a goal. But the Chinese counterpart is clearly atelic because one can buy any fish with any size or age and begin to raise that fish at any time.

^{vii} Angelika Kratzer (personal communication) has pointed out to me that in order for the value of e_{pro} to be dependent upon the event argument of the next higher clause, it is necessary to project the event argument of a verb syntactically so that e_{pro} can be

coindexed with the event argument. I assume that this technical detail can be implemented in a way as in Kusumoto’s (1999) dissertation about time argument. However, to simplify my discussion, I will not represent the event argument in the syntax.

^{viii} The reason why the equation symbol must be understood as an overlapping relation rather than an identity relation has to do with examples like (i).

- (i) Jin nian wo yang-le yi-tiao jinyu
 this year I raise-Asp one-CL goldfish
 ‘This year, I am raising a goldfish.’

In (i), the topic time *jin nian* ‘this year’ clearly only overlaps but is not identical to the run time of the speech event.

^{ix} However, it is very likely for one to argue that the final sub-interval of the topic time in (24) abuts rather than overlaps the initial subinterval of the matrix event time. If this is the case, then something more needs to be said about telic vs. atelic situations in embedded contexts. Namely, the equation symbol that is added to the precedence condition ‘ $t_2 < \tau(e_{pro})$ ’ in (22i) is needed only when the sentence containing *le* describe an atelic situation. When the sentence is telic, it can only be a strict precedence relation. In other words, the meaning of *le* should be further revised to reflect this telic-atelic distinction. One possibility to do this is as follows:

$$(i) [[le]] =: \lambda P \lambda t_2 \lambda e \exists e' [P(e) \wedge P(e') \wedge e' \leq_E e \wedge \tau(e') \subseteq t_2 \wedge \exists R [R \in \{<, \leq\} R(t_2, \tau(e_{pro})) \wedge [(TELIC(e) \rightarrow R = <) \vee [ATELIC(e) \rightarrow R = \leq]]]]$$

In (i), the condition “ $\exists R [R \in \{<, \leq\} R(t_2, \tau(e_{pro})) \wedge [TELIC(e) \rightarrow R = <] \vee ATELIC(e) \rightarrow R = \leq]$ ” says that there exists a relation R between the topic time and the runtime of e_{pro} and R can be a strict precedence, or a precedence or overlapping relation and that if e is telic, R must be a precedence relation and if e is atelic, R can be a precedence or overlapping relation.

^x The experiential marker *guo* has some other interesting features such as

discontinuity effect. However, I will not be able to discuss those issues which are less related to temporal reference.

^{xi} However, I think it is wrong to claim that *zhe*, *le* and *guo* are two-way ambiguous as suggested by Li (1999). The absolute-relative distinction is nothing but a reflection of different choices of value for *e_{pro}*.

^{xii} Barbara Partee (personal communication) has pointed out to me that the constraint associated with verbs like *kanjian* ‘see’ is possibly cognitive rather than linguistic. Thus, in a sentence like *I saw it*, where the object is a pronoun, one still gets the overlapping relation.

^{xiii} In fact, (42a) can also be uttered in a situation where Zhangsan is still writing the book. I will come back to this reading later.

^{xiv} The existence presupposition sometimes does not seem to hold as in the following example.

(i) Wo xiang mai yi-ben youguan wuaixing ren de shu
I want buy one-CL about alien person DE book
‘I want to buy a book about alien people.’

The loss of the existence presupposition is due to the fact that the existential operator is embedded within the operator *xiang* ‘want’.

^{xv} von Stechow (2001) has a very detailed review of all the analyses concerning the representation of creation verbs in the literature. I refer the reader to his work for a comparison of these different analyses..

^{xvi} When the adverbial clause is a *yihou*-clause, it seems that the matrix clause cannot be an atelic (stative) clause. Even for examples like (64c), the matrix clause has an inchoative reading and is more natural if the verb *bian-de* ‘turn’ is added before the adjective *hen qingsong* ‘very relaxed’.

^{xvii} *Zicong...yihou* can be treated as a discontinuous constituent expressing the notion of the English word *since*.

References

- Binnick, Robert I. (1991) *Time and the Verb: A guide to Tense and Aspect*, Oxford University Press, New York.
- Bohnenmeyer, Jürgen and Mary Swift (2001) “Default Aspect: The Semantic Interaction of Aspectual Viewpoint and Telicity,” *Proceedings of Perspectives on Aspect*, Utrecht Institute of Linguistics, 2001.
- Carlson, Gregory (1977) *Reference to Kinds*, PhD dissertation, University of Massachusetts, Amherst.
- Chan, M (1980) “Temporal Reference in Mandarin Chinese: An Analytic-semantic Approach to the Study of the Morphemes LE, ZAI, ZHE and NE,” *JCLTA* 15: 33-79.

-
- Chao, Y. R. (1968) *A Grammar of Spoken Chinese*, University of California Press, Berkeley.
- Chierchia, Gennaro (1995) “Individuallevel Predicates as Inherent Generics,” in Gregory N. Carlson and Francis Jeffrey Pelletier (eds.), *The Generic Book*, The University of Chicago Press, Chicago, pp. 176-223.
- Comrie, B. (1976) *Aspect: An Introduction to the Study of Verbal Aspect and Related Problems*, Cambridge University Press, Cambridge.
- Comrie, B., (1985). *Tense*. Cambridge University Press, Cambridge.
- Dai, Yaojing (1994) “Le Zai Biaoshi WeilaiYiyi Juzi Zhong De Yongfa [Usage of Le in Sentences Expressing Future Meaning],” in Zhihong Yu (ed.), *Xiandai Yuyanxue: Lilun Jianshe De Xin Shikao*, pp.115-122.
- Dowty, David (1979) *Word Meaning and Montague Grammar: The Semantics of Verbs and Times in Generative Semantics and in Montague’s PTQ*, D. Reidle, Dordrecht.
- M. Erbaugh and Smith C. S. (2001) “Temporal information in sentences of Mandarin,” Manuscript. University of Texas and City University of Hong Kong.
- von Stechow, Kai (1994) *Restrictions on Quantifier Domains*, PhD Dissertation, University of Massachusetts, Amherst.
- Grice, H. P. (1975) “Logic and Conversation,” in P. Cole and J. L. Morgan (eds.) *Syntax and semantics, Vol.3: Speech acts*, Academic Press, New York, pp. 41-58.
- Heim, Irene (1982) *The Semantics of Definite and Indefinite Noun Phrases*, PhD dissertation, University of Massachusetts, Amherst.
- Heim, Irene and Angelika Kratzer (1998) *Semantics in Generative Grammar*, Blackwell, Oxford.

-
- Huang, L. Meei-jin (1987) *Aspect: A General System and Its manifestation in Mandarin Chinese*, PhD dissertation, Rice University.
- Jin, Lixin (2002) “Ciwei ‘Le’ De Shiti Yiyi Ji Qi Jufa Tiaojian [The Tense/Aspectual Meaning of the Sentence-final *Le* and its Syntactic Conditions],” *Shijie Hanyu Jiaoxue* 1, 34-43.
- Kamp, H and Uwe Reyle (1993) *From Discourse to Logic: Introduction to Modeltheoretic Semantics of Natural Language, Formal Logic and Discourse Representation Theory*, Kluwer Academic Publishers, Dordrecht.
- Kang, Jian (1999) *The Composition of the Perfective Aspect in Mandarin Chinese*, PhD dissertation, Boston University, Boston.
- Kitagawa, Yoshihisa (1986) *Subjects in Japanese and English*, PhD dissertation, University of Massachusetts, Amherst.
- Klein, W. (1994) *Time in Language*, Routledge, London.
- Klein, W, Li Ping and Henriette Hendriks (2000) “Aspect and Assertion in Mandarin Chinese,” *Natural Language and Linguistic Theory* 18, 723-770.
- Kong, Lingda (1986) “Guanyu Dongtai Zhuci ‘Guo₁’ Han ‘Guo₂’ [On Dynamic Particles *Guo₁* and *Guo₂*],” *Zhongguo Yuwen* 4, 272-280.
- Koopman, Hilda and Dominique Sportiche (1991) “The Position of Subjects,” *Lingua* 85, 211-258.
- Kratzer, Angelika (1994) *The Event Argument and the Semantics of Voice*, Manuscript, University of Massachusetts at Amherst.
- Kratzer, Angelika (1998) “More Structural analogies Between Pronouns and Tenses,” SALT 8, Proceedings From the 8th Conference of Semantics and Linguistic Theory, MIT, 1998, pp. 92-110.
- Kratzer, Angelika (2000) “Building Statives”, in Lisa, J Conathan, et al. (eds.)

-
- Proceedings of the Twenty-Sixth Annual Meeting of the Berkeley Linguistics Society*, Berkeley Linguistics Society, Berkeley, pp.385-400.
- Krifka, M. (1989) 'Nominal Reference, Temporal Constitution and Quantification in Event Semantics,' in R. Bartsch, J. van Benthem, and P. van Emde Boas (eds.), *Semantics and Contextual Expression*, Foris, Dordrecht, pp. 75-115.
- Kusumoto, Kiyomi (1999) *Tense in Embedded Contexts*, PhD dissertation, University of Massachusetts, Amherst.
- Li, C. and S. A. Thompson (1981) *Mandarin Chinese: A Functional Reference Grammar*, University of California Press, Berkeley.
- Li, C., S. A. Thompson and R. M. Thompson (1982) "The Discourse Motivation for the Perfect Aspect: the Mandarin Particle LE", in P. Hopper (ed.), *Tense and Aspect: Between Semantics and Pragmatics*, John Benjamins Publishing Company.
- Li, Ping and Yasuhiro Shirai (2000) "The Acquisition of Lexical and Grammatical Aspect", Mouton de Gruyter, Berlin.
- Li, Tiegeng (1999) *The Study of Tense in Modern Chinese*, Liaoling University Press, Shenyang.
- Lin, Jo-wang (1999) "Double Quantification and The Meaning of *Shenme* 'what' in Chinese Bare Conditionals," *Linguistics and Philosophy* 22, 3-593.
- Lin, Jo-wang (2000a) "On the Conditions of the Use of the Chinese Imperfective Aspectual Marker *-Zhe* and Its Temporal Meaning", Paper read in The 9th International Conference on Chinese Linguistics, York Hotel, Singapore.
- Lin, Jo-wang (2000b) "On the Temporal Meaning of the Verbal *-le* in Chinese," *Language and Linguistics* 1(2), 109-133.
- Lin, Jo-wang (2002) "Selectional Restrictions and Temporal Reference of Chinese Bare Sentences," *Lingua* 113, 271-302.

-
- Liu, Yuehua (1988) “Dongtai Zhuci ‘guo₁’, ‘guo₂’, ‘le₁’ Yongfa Bijiao [A Comparative Study of the Dynamic Particles Guo₁, Guo₂ and Le₁],” *Yuwen Yanjiu* 1, 6-16.
- Liu, Xunning (1988) “Xiandai Hanyu Ciwei ‘le’ DE Yufa Yiyi,” *Zongguo Yuwen* 5, 321-330.
- Liu, Xiaomei (1997) *Guo Ming Ke Yu De Dongtai Wenfa Tixi Ji Dongtaici De Shangjia Dongmao Yuyi* [The Grammatical System of Mood in Mandarin Chinese, Southern Min Chinese and Haka Chinese and the Aspectual Meanings of Aspectual Markers], The Crane Publishing Co., LTD, Taipei.
- Magione, L and Dingxuan Li (1993) “A Compositional Analysis of –Guo and –Le”, *Journal of Chinese Linguistics*, 65-122.
- Mochizuki, Keiko (2000) “Hanyu Li De Wancheng Ti [The Perfect Aspect in Chinese],” *Hanyu Xuexi*, Issue 1, 12-16.
- Montague, Richard (1974) *Formal Philosophy: Selected Papers of Richard Montague*, Richmond Thomason (ed.) Yale University Press, New Haven.
- Ogihara, Toshiyuki (1989) *Temporal Reference in English and Japanese*, PhD dissertation, University of Texas, Austin.
- Ogihara, Toshiyuki (1996) *Tense, Attitudes and Scope*, Kluwer Academic Publishers, Dordrecht.
- Parsons, Terrence (1990) *Events in the Semantics of English*, MIT Press, Cambridge.
- Partee, Barbara H. (1984) “Nominal and Temporal Anaphora,” *Linguistics and Philosophy* 7, 243-286.
- Portner, Paul (1992) *Situation Theory and the Semantics of Propositional Expressions*, PhD Dissertation, University of Massachusetts, Amherst.
- Ross, Claudia (1995) “Temporal and Aspectual Reference in Mandarin Chinese,”

-
- Journal of Chinese Linguistics* 23, 87-135.
- Schmitt, C., 2001. "Cross-linguistic variation and the present perfect: the case of Portuguese," *Natural Language and Linguistic Theory* 19, 403-453.
- Shi, Zhiqiang (1990) "Decomposition of Perfectivity and Inchoativity and the Meaning of the Particle *Le* in Mandarin Chinese," *Journal of Chinese Linguistics* 18, 95-124.
- Stowell, Tim (1993) "Syntax of Tense," Manuscript, University of California, Los Angeles.
- de Swart, H. (1998) "Aspect Shift and Coercion," *Natural Language and Linguistic Theory* 16, 347-385.
- Teng, S. H. (1975) *A Semantic Study of Transitivity Relations in Chinese*, University of California Press, Berkeley.
- von Stechow, Arnim (2001) "Temporally Opaque Arguments in Verbs of Creation," in Carlo Cecchetto, Gennaro Chierchia and Maria Tessa Guasti (eds.), *Semantic Interfaces*, CSLI Publications, Stanford, pp. 278-319.
- Wang, W. S. Y. (1965) "Two Aspect Markers in Mandarin," *Language* 41, 457-470.
- Wilkinson, Karina (1991) *Studies in the Semantics of Generic Noun Phrases*, PhD dissertation, University of Massachusetts at Amherst.
- Xing, Fuyi (1996) *Hanyu Yufaxue*, Dongbei Shifandaxue Chubanshe, Changchun.
- Yeh, Meng (1996) "An Analysis of the Experiential GUO_{EXP} in Mandarin Chinese: A Temporal Quantifier," *Journal of East Asian Linguistics* 5, 151-182.
- Zhu, Dexi (1982) *Yufa Jiāngyì* [Notes on Grammar], Shangwu Yingshuguan, Beijing.