Time in a language without Tense: The case of Chinese*

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Abstract

This paper outlines a framework of the temporal interpretation in Chinese with a special focus on complement and relative clauses. It argues that Chinese not only has no morphological tenses but lack empty semantic features under an empty tense node. Instead, it utilizes various factors such as the information provided by default aspect, the tense-aspect particles, and pragmatic reasoning to determine the temporal interpretation of sentences. It is shown that aspect in Chinese replaces the role that tense plays in a tense language. This result implies that the Chinese phrase structure has AspP above VP but no TP is above AspP.

1. Introduction

It is well-known that Chinese is a language without tense morphology. However, it is sometimes suggested that it has a possibly empty Inflection (INFL) node (Huang (1998); Li (1990), among others).[1] If this assumption is correct, it implies that Chinese might have empty semantic tenses/features such as [+present] or [+past] under an empty tense node which determine the temporal interpretation of a sentence. In this paper, I will argue that Chinese not only has no morphological tenses but lack semantic tenses in the above sense. Instead, it utilizes various other factors such as the information provided by default aspect, the tense-aspect particles, and pragmatic reasoning to determine the temporal interpretation of sentences.[2] In particular, I will show that aspect in Chinese replaces the role that tense plays in a tense language with respect to the temporal interpretation of a sentence. In other words, the Chinese phrase structure has AspP above VP but there is no TP above AspP. This is true not only for simplex sentences but for embedded clauses.

Among the many devices that the Chinese language uses to determine the temporal interpretation, I will in particular explore the following factors:

(A) Temporal adverbs: *zuotian* 'yesterday', 1996 *nian* 'the year of 1996', etc.

[1] Both Huang (1998) and Li (1990) do not directly claim the existence of TP in Chinese, though they do claim that the finite-nonfinite distinction in terms of INFL exists. For arguments against Huang's (1998), Li's (1990) and other people's claims about the finite-nonfinite distinction in Chinese, see Pan, Hu and Xu (2001).

[2] Also see Li (1999), Lin (2003a, 2003c) and Erbaugh and Smith (2002) for relevant discussions.

(B) Modal verbs: *hui* 'will', *yinggai* 'should', etc.
(C) Aspectual particles: *le* 'perfective/imperfective', *guo* 'perfective', *zai* 'imperfective', *zhe* 'imperfective', etc.
(D) Aktionsart of the VP and viewpoint aspect determined by it.
(E) Scope of the DP containing the relative clause.
(F) Definiteness or informational status of the DP containing the relative clause.

In addition to the above factors, there are a number of pragmatic principles that make use of the above pieces of information and determine the temporal interpretation of a clause. To discuss how the above pieces of information are used in interpreting time in Chinese, in what follows, I will discuss the temporal interpretation of Chinese sentences in general and of complement and relative clauses in particular.

2. The Basics of the Temporal Interpretation in Chinese

As noted at the outset of this article, Chinese is usually classified as a tenseless language, as its verbs are not inflected for overt morphological tense markers. Thus, unlike the temporal interpretation in English, which can be determined by morphological tenses, the temporal interpretation in Chinese is not determined by tense markers. If we disregard contextual information from the previous discourse, there are at least four main factors which influence the temporal interpretation of simplex sentences in Chinese: (i) the use of temporal adverbials, (ii) default viewpoint aspect, (iii) the use of aspectual markers, and (iv) the use of modal verbs. I discuss these factors in turn.[3] Before doing this, I want to first spell out my assumption about the Chinese phrase structure, which is $[_{CP}\ldots[_{IP}\ldots\ [_{ModalP}\ldots\ [_{AspP}\ldots\ [_{VP}\ldots]]]]]$. There is no TP above Asp, because Chinese, as I will argue later, has neither morphological tenses nor covert semantic features under an empty tense node.

2.1 Temporal adverbs

It is self-evident that temporal adverbials determine the temporal interpretation of a sentence, as is illustrated by (1).

(1) Zhangsan zuotian qu ni jia
Zhangsan yesterday go you house
'Zhangsan went to your house yesterday.'

[3] Also See Erbaugh and Smith (2002) for a discussion of these factors.

An important point about temporal adverbials is that they override temporal information provided by other devices such as default viewpoint aspect or aspectual markers to be discussed below.

2.2 Default viewpoint aspect

In Chinese the use of a temporal adverbial is not obligatory. It is not uncommon to find sentences without any temporal adverbials or aspectual markers. Illustrated below are some such examples.

(2) a. Zhangsan hen mang
Zhangsan very busy
'Zhangsan is very busy.'
b. Ni da lanqiu ma?
you play basketball Q
'Do you play basketball?'

(3) a. Zhangsan dapuo yi-ge huaping
Zhangsan break one-Cl vase
'Zhangsan broke a vase.'
b. Ta dai ni qu nail?
ta take you go where
'Where did he take you?'

Read isolatedly, (2a) is interpreted as equivalent to a present tense sentence and (2b) to a present generic sentence. In contrast, the two sentences in (3) have a past interpretation.[4] Lin (2003a, 2003c) has proposed that the temporal interpretation of sentences without any temporal adverbs or aspectual markers be determined via their viewpoint aspect. Namely, a sentence with the imperfective viewpoint aspect has a present interpretation, whereas a sentence with the perfective viewpoint aspect has a past interpretation.[5] This is achieved as follows.

Bohnemeyer and Swift (2001, 2004) have argued that in telicity-dependent languages there is a certain correlation between the telicity of an eventuality description and its aspectual viewpoint when the sentence is not overtly marked for viewpoint aspect. Roughly, according to their analysis, 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 event it denotes has at least one non-final part that falls under the same predicate.

[4] Note that when a predicate is non-punctual, an aspectual marker is usually needed, unless the construction is a serial verb construction as in (3b). I have no idea why this is the case.
[5] Erbaugh and Smith (2002) also propose a theory which is very similar to Lin's (2003a).

According to them, cross-linguistically the default viewpoint aspect of telic descriptions is perfective viewpoint, whereas the default viewpoint aspect of atelic descriptions is imperfective viewpoint and this can be derived from a notion of event realization. In this paper, I will assume their notion of default aspect. They define default aspect as in (4a), where t_{TOP} is equivalent to Klein's (1994) topic time, a time at which a sentence is asserted to be true. The notion of event realization is defined in (4b).

(4) a. DASP = $\lambda P \lambda t_{TOP} \exists e[REAL_E(P, t_{TOP}, e)]$ (Bohnemeyer and Swift 2004: 286)

b. $\forall P, t_{TOP}, e \subseteq E[REAL_E(P, t_{TOP}, e) \leftrightarrow \exists e'[P(e') \wedge e' \subseteq_E e \wedge \tau(e') \subseteq_T t_{TOP}]]$

(5) a. Perfective aspect =: $\lambda P_{<i,t>} \lambda t_{Top} \exists t[t \subseteq t_{Top} \wedge P(t)]$

b. Imperfective Aspect =: $\lambda P_{<i,t>} \lambda t_{Top} \exists t[t_{Top} \, O \, t \wedge P(t)]$

The idea of event realization is that a predicate *P* is realized by event *e* at topic time t_{TOP} if and only if *P* is true of a part *e*' of event *e* and the run time of *e*' is included within the topic time t_{TOP}. From the above definition, we can infer that for a telic event to be realized (to occur or to happen), the whole event must be completed. Therefore, the default aspect of a telic event is perfective viewpoint, whose formal definition is (5a)—i.e., the perfective viewpoint requires that the event time of a situation be entirely included within the topic time. In contrast, for a (stative) atelic eventuality to be realized, it is sufficient for a part of the atelic eventuality to hold at the topic time. Therefore, the default aspect of an atelic eventuality is the imperfective viewpoint, whose definition requires that the topic time is included within or overlaps the event time of a situation as in (5b).[6] Given Bohnemeyer and Swift's definitions in (4), we can conclude that the default viewpoint aspect of (2a) and (2b) is imperfective, whereas the default viewpoint aspect of (3a) and (3b) is perfective.

This said, the present interpretation of (2a) and (2b) is derived as follows. The topic time is the speech time by default. Given that the sentence has the imperfective viewpoint aspect, the speech time overlaps or is included within the situation time. Therefore, (2a) and (2b) have a present interpretation.

In contrast, the default viewpoint aspect of (3a) and (3b) is perfective. So the situation time must be included within the topic time. However, the topic time cannot be a future time, because the future interpretation in Chinese is obligatorily marked by an overt temporal adverbial or a marker like *hui* 'will'. Nor can the topic time be the

[6] This is a simplified story of Bohnemeyer and Swift (2004). The reader is referred to their article for more details. Also notice that according to Kamp and Reyle (1993: 513), the relation between an (imperfective) stative eventuality and the topic time is an overlap relation, not an inclusion relation. I accept their view and hence use the overlap relation in (5b) instead of the inclusion relation as in Bohnemeyer and Swift (2004).

speech time, because a non-future perfective telic event must have already completed before one can talk about it. If a telic event is not completed at the time one talks about it, the viewpoint aspect must be imperfective rather than perfective. Moreover, in Chinese an episodic imperfective event is overtly marked. From here, it can be inferred that the topic time of (3a) and (3b) is a past interval provided by the context. Therefore (3a) and (3b) have a past interpretation.

Given that perfective aspect in Chinese entails a past interpretation, I propose that this be incorporated into the definition of perfective aspect as in (6).

(6) Perfective aspect = $\lambda P_{<i,t>} \lambda t_{Top} \lambda t_0 \exists t[t \subseteq t_{Top} \wedge P(t) \wedge t_{Top} < t_0]$

(6) is essentially identical to (5a) except for the additional requirement that the topic time needs to precede the local evaluation time designated as t_0. In independent sentences, this evaluation time is the speech time, whereas in complement clauses, it is the attitude time. As a concrete illustration, let's apply (6) to (3a). The result is (7a).

(7) a. $\lambda t_{Top} \lambda t_0 \exists t \exists x[t \subseteq t_{Top} \wedge t_{Top} < t_0 \wedge break'(t,z,x) \wedge vase'(x)]$
b. $\lambda R_{<i,<i,t>>} \lambda t_1 \exists t_2 R(t_2)(t_1)$
c. $\lambda t_0 \exists t_{Top} \exists t \exists x[t \subseteq t_{Top} \wedge t_{Top} < t_0 \wedge break'(t,z,x) \wedge vase'(x)]$

I assume that if the output translation of a sentence is of type <i,<i,t>>, an existential closure rule as defined in (7b) will automatically close the t_{Top} variable in (7a), yielding the representation in (7c) when no overt topic time is available. Since (3a) is an independent sentence, the evaluation time t_0 in (7c) is the speech time. In other words, the topic time must precede the speech time. The precedence relation imposed by the perfective aspect in Chinese thus is functionally like the past tense in English.

2.3 Aspectual markers

Before discussing examples with an aspectual marker, I would like to first make a few remarks on event structure. I assume, roughly following Caudal (1999), that (the time of) an eventuality canonically breaks down into (the time of) Inner Stage, represented as t_{is} and (the time of) Result Stage, represented as t_{rs}.[7] For a dynamic event, the Inner Stage of an eventuality *e* is the event's development. For a state, the Inner Stage is the state itself. The notion of Result Stage refers to the result state of an eventuality. This notion is not problematic for accomplishments and achievements. But are activities

[7] To simplify the logical formulae, I do not introduce event arguments for verbs. So verbs have only time arguments. Of course, one can assume that verbs have an event argument and time argument simultaneously or just an event argument and derive the time of an eventuality via the trace function.

and states associated with a result stage? The answer that the traditional assumption provides might be no. However, I would like to make a novel assumption here. I propose that a function called Rstage is defined in such a way that it may apply to (the time of) any eventuality and returns (the time of) the result stage associated with that eventuality. For example, when applied to an accomplishment such as *John goes to America*, it returns (the duration of) the result state of John's being in America. The idea of Rstage is not new. What is novel is that Rstage may also apply to activities and states, yielding (the duration of) a result state for them. However, the result states for activities and states are a special kind of eventuality, which I will refer to as empty result states. I assume that empty eventualities exist in all times. The motivation of empty result states will become clearer later. Since we want the inner time and result state time of an event P at time t, the functions Istage and Rstage must depend on P and can be defined as follows.

(8) a. Istage(t,P) is defined if P(t) = 1, in which case, if P is telic, Istage(t,P) = t_{is}, where t_{is} is t minus the last point of t; if P is atelic, Istage(t,P) = t.
b. Rstage(t,P) is defined if P(t) = 1, in which case Rstage(t,P) = t_{rs}, where t_{rs} is a time at which the result state of P exists, if P is telic; if P is atelic, t_{rs} is the entire time interval, i.e., the time.[8,9]

Another point to make here is that the literature on Chinese aspectual markers such as *le*, *guo* and *zhe* is so huge that it is impossible to give even a brief overview here, due to restrictions of space ((Kong (1986); Huang (1988); Xunning Liu (1988); Yuehua Liu (1988); Shi (1990); Magione and Li (1993); Dai (1994); Ross (1995); Yeh (1996); Smith (1997); Liu (1997); Li (1999); Kang (1999); Lin (2000, 2003a); Klein, Li and Hendriks (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.

2.3.1 The experiential marker *guo*

Now let us discuss the experiential marker *guo*, which seems to always imply the pastness of the whole eventuality regardless of the situation type involved. This is illustrated by the following examples.

(9) a. Lisi he-guo jiu
Lisi drink-Asp wine
'Lisi drank wine before.'

[8] I assume that empty eventualities, hence empty result states, occupy the entire time.
[9] It is notoriously unclear whether and how the notion of "the result of P" could be defined. So in this paper, I will not be able to be more precise than what is written here in (8b) for this notion.

b. Lisi zuo-guo yi-ge qishi dangao
Lisi make-Asp one-Cl cheese cake
'Lisi made a cheese cake before.'

c. Wo xiangxin-guo ni
I believe-Asp you
'I believed you before.'

d. Lisi die-duan-guo zuo tui
Lisi fall-broken-Asp left leg
'Lisi broke his left leg before.'

(9d) is worth special mentioning here, because it involves a result state. What is interesting about the result state is that it may not hold at the utterance (evaluation) time; namely, the broken leg must be cured before the utterance time. This property of *guo* is known as the "discontinuity effect" in the literature. A very simple way to capture the past interpretation and the discontinuity effect of *guo* is to say that the whole eventuality, including the Inner Stage and the Result Stage, must precede the evaluation time.

Although the above analysis successfully accounts for the temporal interpretation of all the examples in (9), I believe that it is wrong. Few people have observed that the so-called "discontinuity effect" actually displays a definite/indefinite asymmetry.[10] Compare the following pair of sentences:

(10) a. Lisi nong-huai-guo zhe-bu shouti-diannao
Lisi make-broken-Asp this laptop
'Lisi broke this laptop before.'

b. Lisi nong-huai-guo yi-bu shouti-diannao
Lisi make-broken-Asp one-Cl laptop
'Lisi broke a laptop before.'

While (10a) implies that the laptop is already fixed at the speech time, (10b) does not have such an implication. (10b) is compatible with a situation where the broken laptop is fixed or one where it is not fixed yet. In fact, it is even possible that the laptop in (10b) is not fixable at all. This reading cannot be captured by the above analysis of *guo*, implying that the discontinuity effect should be captured in another way.

I would like to propose to detach the discontinuity effect from the temporal meaning of *guo* and derive it from another well-known property of *guo*, which requires that the eventuality modified by it be repeatable at the evaluation time. The

[10] This asymmetry is discussed in Liao (2003), who credits the observation to Jo-wang Lin.

account that I am going to offer is based on Wu's (2005) idea. In (10a), the object NP is a definite NP. The referent of this definite NP is not only the theme of the first laptop-breaking event but also the theme of any other potentially repeated laptop-breaking event. However, in order for the same laptop to be broken in a repeated event, it should be first fixed before it is broken again. Similar remarks apply to the case of the broken leg in (9d). Before one's leg can be broken again, it should be recovered first. Therefore, the discontinuity effect of *guo* is actually derivable from the repeatability condition.

What about (10b)? Here, the object NP *yi-bu shouti diannao* 'a laptop' is an indefinite NP, not a definite NP. Therefore, in order for a similar event to reoccur, any indefinite laptop can serve the purpose. Since the laptop involved in the repeated event need not be the same laptop as the one in the original event, there is no requirement that the original laptop be fixed before another one is broken. It might be fixed but this is not a requirement. There is simply no logical connection between the two laptops.

If what I said above is correct, then we can say that the temporal meaning of *guo* only requires that the Inner Stage of the eventuality modified by *guo* precede the evaluation time. On the other hand, the repeatability condition will force the discontinuity effect in most cases, unless the theme of the event is an indefinite NP. Given this, I propose that the temporal meaning of *guo* is the following:

(11) <u>The temporal semantics of *guo*</u>

$$||\textbf{guo}|| = \lambda P_{<i,t>}\lambda t_{Top}\lambda t_{eva}\exists t_{is}\exists t[P(t) \wedge IStage(t,P) = t_{is} \wedge t_{is} \subseteq t_{Top} \wedge t_{Top} < t_{eva}]$$ [11]

Essentially what (11) says is that the use of *guo* requires that the time of the inner stage of an eventuality is included within the topic time t_{Top}, which in turn precedes the evaluation time t_{eva}. The repeatability condition can be treated as a presupposition of *guo*, though I will not spell out the details. To illustrate, according to (11), (9c) has the logical representation in (12a) and is interpreted as (12b), where the speech time, represented as s*, is the default evaluation time. (I assume that the subject originates in the specifier position of VP and is later moved to the specifier position of IP.)

(12) a. $[_{IP}\ wo_i\ [_{AspP}\ guo\ [_{VP}\ t_i\ xiangxin\ ni]]]$

b. $\exists t_{Top}\exists t\exists t_{is}$[believe'(you')(I')(t) $\wedge$ IStage(t,P) = $t_{is} \wedge t_{is} \subseteq t_{Top} \wedge t_{Top} < s^*$]

[11] If we have event rather than time arguments for verbs, the semantics of *guo* can be alternatively defined as in (i). Similar remarks may apply to the semantics of *le* to be discussed later.

(i) $||\textbf{guo}|| = \lambda P_{<i,t>}\lambda t_{Top}\lambda t_{eva}\exists e_{is}\exists e[P(e) \wedge IStage(e) = e_{is} \wedge Running\text{-}Time(e_{is}) \subseteq t_{Top} \wedge t_{Top} < t_{eva}]$

The final point about *guo* that I want to make is that its semantics is not deictic, because when a clause with *guo* is embedded, the evaluation time can be shifted to the matrix event time. This is illustrated by sentences like *Zhangsan shuo ta xiangxin-guo ni* 'Zhangsan said that he had believed you'. Therefore, the role of *guo* is somewhat like a relative past tense operator.

2.3.2 The perfective/imperfective marker *le*

The next aspectual marker to be discussed is the verbal *le*, which like the experiential marker *guo*, is often assumed to be a perfective marker. However, the temporal meaning of *le* differs from that of *guo* in many crucial ways. The following examples illustrate the semantics of *le*.

(13) a. ?Lisi he-le jiu
Lisi drink-Asp wine
'Lisi drank wine.'

b. Lisi zuo-le yi-ge qishi dangao
Lisi make-Asp one-Cl cheese cake
'Lisi has made a cheese cake.'

c. Quan xiao de ren dou zhidao-le zhe-jian shi
all school Gen person all know-Asp this-Cl matter
'All the people in the school have known this matter.'

d. Lisi die-duan-le zuo tui
Lisi fall-broken-Asp left leg
'Lisi has broken his left leg.'

When *le* occurs in an activity as in (13a), the sentence often sounds incomplete and needs another continuing sentence to make it fully grammatical as in *Lisi he-le jiu, ye chang-le ge* 'Lisi drank wine and sang songs as well'. It is not clear to me why this is the case. Yet to the extent that such patterns are interpretable, they have a past interpretation. (13a) means that the wine-drinking event occurred before the speech time.

When *le* occurs in an accomplishment, it assigns the sentence a past interpretation too. So (13b) means that the cake-making event took place before the speech time.

Not every stative verb may take *le* as a verbal suffix. Verbs like *zhidao* 'know', *xiangxin* 'believe', *you* 'have', etc., may do so, but verbs like *shuyu* 'belong to',

renwei ‘think’, *peifu* ‘admire’, etc., may not. When a stative verb is combined with *le*, the sentence gets an inchoative interpretation. Thus, (13c) implies a change of state from the state of not knowing to the state of knowing. In fact, we do not need to analyze those stative verbs combined with *le* as true stative verbs but can treat them as being type-coerced into achievement verbs. This explains why examples like (13c) are tinted with dynamicity.

Finally, when *le* occurs with an achievement verb or a bisyllabic resultative verb, it implies that the ensuing result state must hold at the evaluation time, though the event itself occurred before that time. Thus, (13d) means that Lisi’s leg-breaking event occurred before the speech time and his leg is still broken at the speech time. This interpretation is similar to the inchoative reading that we saw in (13c), which implies that the new state holds at the speech time. In fact, we can say that (13b) has the same type of interpretation in that though the cake-making event occurred before the speech time, the existence of the cake must hold at the speech time.

It is significant to note that in (13b,c,d), there is no overt temporal adverbial in the sentence. Now consider a case where a temporal adverbial is present as in (14).

(14) Lisi shang-ge yue die-duan-le tuei
Lisi last-Cl month fall-broken-Asp leg
‘Lisi broke his leg last month.’

In (14), we have a temporal frame adverbial referring to a past interval. Therefore, the leg-breaking event must occur within that past interval. But what about the ensuing result state? Does it still have to hold true at the speech time? It can, but this doesn’t seem to be what is asserted in (14). What is asserted is that the leg-breaking event occurred last month and the state of the leg being broken was true then. Lisi’s leg might be still broken at the speech time but this is not directly asserted. The situation here is much similar to the contrast between the following two sentences, where the predicate denotes a state.

(15) a. Lisi hen jushang
Lisi very depressed
‘Lisi is depressed.’
b. Lisi shang-ge yue hen jushang
Lisi last-Cl month very depressed
‘Lisi was depressed last month.’

The sentence in (15a) does not have a temporal adverbial, so the topic time is the

speech time by default and thus the state is asserted to be true at the speech time. However, when a temporal adverbial is present as in (15b), the state is only asserted to be true of an interval overlapping the interval denoted by the temporal adverbial. The state of being depressed might still be true at the speech time (as can be proved by adding a continuing sentence such as *Xianzai ye hai hen jushang* 'now he is still depressed) but this is not part of the assertion made by the speaker.

What we have learned above is this: the temporal interpretation of the result state of an event sentence with *le* seems parallel to that of simple state sentences and can be independent of the temporal interpretation of the inner stage of that event. This is particularly clear in cases where there is no temporal adverbial as in (13d). In (13d), the inner stage is true of an interval before the speech time but the result stage must be true at the speech time. This suggests that the inner stage and the result stage each have their own independent topic time at which they are asserted to be true. However, when an overt temporal adverbial is present as in (14), the topic times for the inner stage and the result stage are always the same, i.e., the time denoted by the overt temporal adverbial. How can this be explained? One way to account for this is to say that the topic time for the result stage is an anaphor-like time variable and hence must be controlled by the overt topic time. On the other hand, when there is no overt temporal adverb, the topic time of the inner stage is existentially closed. Suppose that such existentially closed implicit topic times are incapable of serving as a controller. Then the anaphor-like time variable must look for another appropriate antecedent and chooses the speech time, made available by uttering the speech, as its value.

On the basis of the above discussion, I now propose the semantics of the verbal *le* as follows.

(16) The Temporal Semantics of *Le*

$\lambda P_{<i,t>}\lambda t_{Top}\lambda t_{eva}\exists t_{is}\exists t_{rs}\exists t[P(t) \wedge Istage(t,P) = t_{is} \wedge t_{is} \subseteq t_{Top} \wedge t_{Top} < t_{eva} \wedge Rstage(t,P) = t_{rs} \wedge t_{rs}\ O\ t_{ana}]$

Briefly, what (16) says is this: the use of *le* requires that the time of the event's development, i.e., the inner stage, is included within the topic time t_{Top}, which in turn precedes the evaluation time t_{eva}, whereas the time of the result stage overlaps a time t_{ana}, which I take to be an anaphor-like variable that needs to be controlled.

An interesting point about the analysis in (16), which crucially differs from every treatment of *le* in the literature is that the semantics of *le* is not a pure perfective marker. On the current treatment, *le* has a perfective meaning only with respect to the inner stage as the condition "$t_{is} \subseteq t_{Top}$" requires. However, the meaning of *le* also has an imperfective component but this time with respect to the result stage. This is

reflected by the condition "t_{rs} O t_{ana}" in (16). Therefore, the meaning of *le* involves both a perfective and an imperfective component.

Notice that the part of imperfective meaning involving the result stage is an obligatory component of the meaning of *le* that I am proposing. A potential problem with this claim is how it can deal with activities, which on the traditional assumption have no result states at all. I would like to argue that this is not a serious problem. As noted, I have assumed that the function Rstage can apply to any dynamic event, including activities. However, unlike accomplishment verbs and achievement verbs, the value that the function Rstage yields for activities are not normal state eventualities but a special kind of empty state eventuality or empty set. Just as normal eventualities exist in time, I assume that empty eventualities exist in time as well. Moreover, they exist in the entire time interval much the same way as an empty set is a subset of every set. On this assumption, the truth conditions of (13a) are the following, where the evaluation time and the anaphor-like time variable both pick out the speech time as their value.

(17) $\exists t_{Top}\exists t_{is}\exists t_{rs}\exists t[\text{drink(wine')(Lisi')}(t) \wedge \text{Istage}(t,P) = t_{is} \wedge t_{is} \subseteq t_{Top} \wedge t_{Top} < s^* \wedge \text{Rstage}(t,P) = t_{rs} \wedge t_{rs}\ O\ s^*]$

The first half of the truth conditions in (17) has no problem. It asserts that the time of the event's development occurred before the speech time. However, the second half needs some comments. Here we have conditions saying that the wine-drinking activity has an empty result stage and the time of that empty result stage overlaps the speech time. How is this claim to be evaluated? As noted, I assume that the time of an empty eventuality overlaps the entire time. Consequently, it overlaps the speech time. It follows that the condition "t_{rs} O t_{ana}" in (17) is a tautology. Therefore, the existence of empty result state does not affect the truth conditions at all. (17) correctly predicts that the activity occurred before the speech time.

A very nice feature of the above treatment of activities is that with the help of (the time of) empty eventualities we can unify the meaning of *le* in all contexts, because we don't have to say that there is a past-tense-like *le* as occurs in activities and an inchoative *le* when it is combined with a type-coerced stative verb, an achievement verb or an accomplishment verb. The superficially different *le*'s in all contexts in fact utilize exactly the same meaning as given in (16).

Another point about the temporal semantics of *le* is that just like *guo* it is not deictic. So in a sentence like *Lisi shuo Zhangsan die-duan-le zuo tui* 'Lisi said that Zhangsan fell and broke his left leg', the evaluation time of the embedded clause is not the speech time but the matrix event time.

Before proceeding to the next aspectual marker, I want to note that unless necessary, I will not use the fine-grained semantics of *le* as given in (16), which involves the use of result stage. When the result stage is not of the main concern, in order to increase the readability of the notations, I will just omit the imperfective part of meaning. This will be the case when I discuss the interaction between the future modal *hui* 'will' and *le*.

2.3.3 The progressive marker *zai*

The temporal semantics of the Chinese progressive marker *zai* seems much close to that of the English progressive. However, unlike the English progressive marker, the Chinese *zai* may not occur with achievement verbs. The use of *zai* is illustrated below.

(18) a. Lisi zai xi-ao
Lisi Prog take-bath
'Lisi is taking a bath.'
b. Lisi zai xie yi-ben xin shu
Lisi Prog write one-Cl new book
'Lisi is writing a new book.'
c. *Lisi zai ying
Lisi Prog win
'Lisi is winning.'

I propose that the syntactic distribution of *zai* be explained by imposing a selectional restriction on its lexical semantics, namely, *zai* can only modify a dynamic durative event. To ignore the complexity of intensionality, i.e., the modality meaning of the progressive as discussed in Dowty (1979) and many others, I propose that the temporal semantics of *zai* is as follows.

(19) $||\textbf{zai}|| = \lambda P_{<i,t>}\lambda t_{Top}\exists t\exists t_{is}[P(t) \wedge Istage(t,P) = t_{is} \wedge t_{Top}\, O\, t_{is} \wedge Dynamic(P) \wedge Durative(P)]$

What (19) says is that *zai* requires that the event modified by it be dynamic and durative and the inner stage, i.e., the event's development overlaps the topic time. Applying (19) to (18a), for example, we will obtain the following temporal meaning: The inner stage of bath-taking event overlaps the topic time, which is the speech time by default. Since the event's development overlaps the speech time, it implies that the event is on-going.

Just like *le* and *guo*, the semantics of *zai* is not deictic but relative, as is proved by the sentence *Lisi shi-fenzhong qian shuo ta zai xi-zao* 'Lisi said ten minutes ago that he was taking a bath', where the time of taking a bath overlaps the time of saying.

2.3.4 The durative marker *zhe*

Chinese has another imperfective marker, the durative marker *zhe*. This marker only occurs with (possibly stage-level) atelic eventualities (Lin 2003b). The use of *zhe* is illustrated in (20).

(20) a. Ta zui li jiao-zhe koxiangtang
he mouth inside chew-Asp chewing-gum
'He is chewing a chewing gum in his mouth.'
b. Ta liu-zhe yi-tou chang fa
he wear-Asp one-head long hair
'He wears his hair long.'
c. *Ta da-puo-zhe beizi
he hit-broken-Asp cup
'He is/was breaking cups.'
d. *Ta xie-zhe ling-pian wenzhang
he write-Asp two-Cl articles
'He is writing two articles.'

I define the temporal semantics of *zhe* as follows:

(21) $||\textbf{zhe}|| = \lambda P_{<i,t>}\lambda t_{Top}\exists t[P(t) \wedge t_{Top}\, O\, t \wedge Atelic(P)]$

According to this analysis of *zhe*, (20a) has a present interpretation because the chewing activity must overlap the speech time. (20b) and (22b) are similar. Like the other aspectual markers in Chinese, the temporal meaning of *zhe* is relative, not deictic. So in the sentence *Lisi zuotian shuo zhuo shang fang-zhe yi-bei cha* 'Lisi said yesterday that a cup of tea was placed on the table', the time of the embedded activity overlaps the matrix event time.

2.4 The future modal verb *hui* 'will'

The future modal verb *hui* 'will/would' has a relative future meaning rather than a deictic one. When *hui* 'will/would' occurs in a simplex sentence, the future is relative

to the speech time; when it is embedded in a subordinate clause, the future is relative to the matrix event time. This is illustrated by (22a) and (22b), respectively.

(22) a. Wo hui zai jia
I will at home
'I will be at home.'
b. Zhangsan shuo ta hui zai jia
Zhangsan say he would at home
'Zhangsan said that he would be at home.'

I assume that the future modal verb *hui* 'will/would' heads the phrase ModalP, which is located above AspP.[12] The basic function of *hui* 'will/would' is to locate the topic time introduced by Asp after the evaluation time. The temporal semantics of *hui* 'will/would' is given as follows:

(23) [[**hui**]] = $\lambda P_{<i,t>}\lambda t\lambda t_{eva}[P(t) \wedge t_{eva} < t]$

Applying (23) to (22a) yields the result in (24b), given the LF in (24a).

(24) a. [$_{IP}$ Wo$_i$ [$_{ModalP}$ hui [$_{AspP}$ [AsP $_{[+imperfective]}$ [[$_{VP}$ t$_i$ zai jia]]]]]
b. $\exists t_{Top}\exists t$[be-at-home'(I')(t) $\wedge$ t O t_{Top} $\wedge$ s* < t_{Top}]

According to (24b), the time of my being at home overlaps the topic time, which is located after the speech time. So (22a) has a future interpretation relative to the speech time.

At this point, it is interesting to discuss the interaction between modal verbs and the aspectual markers *le* and *guo*. These two markers are incompatible with the modal auxiliary *hui* 'will' as is shown by (25) (Lin 2000).[13]

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[12] Lin and Tang (1995) have argued that modal verbs are true verbs and project a VP. Whether we assume that modal verbs project VP or ModalP does not affect the point to be made.

[13] The aspectual marker *le* may appear in future contexts such as a conditional clause or *deng*-clause as in (i) below.

(i) a. Yaoshi Lisi dang-le zongtong, wo yiding quanli bangzhu ta
if Lisi select-Asp president I definitely all-effort assist him
'If Lisi is selected as president, I will definitely assist him with all my effort.'
b. Deng ni nadao-le boshi xuewei, wo jiu mai xinche gei ni
wait you get-Asp doctor degree I then buy new-car for you
'After you have got your doctor degree, I will buy a new car for you.'

Examples such as those in (i) have been taken as evidence that *le* is not a past-tense marker in Chinese (Lin 2000, for example). However, even in such future contexts, *le* and *hui* may not occur. If *hui* 'will ' is added, the sentence becomes ill-formed.

(25) *Lisi hui likai-guo/le bangongshi
Lisi will leave-Asp office
'Lisi will have left the office.'

Why is *hui* 'will' incompatible with *le* and *guo*? I claim that (25) is ill-formed due to a type mismatch. As stated in (23), the function denoted by *hui* 'will/would' requires an expression of type <i,t> to serve as its argument. However, as discussed earlier, the output translation of the combination of *le*/*guo* with a VP is an expression of type <i,<i,t>> due to the addition of an evaluation time variable. Therefore, semantic computation crashes when *hui* 'will/would' is combined with an AspP with *le* or *guo*. In fact, the ungrammaticality of (25) can be seen as evidence in support of the proposed treatment of *le* and *guo* as involving a precedence relation between the topic time and the evaluation time.

In contrast to *le* and *guo*, *hui* 'will/would' can be combined with an AspP with the progressive marker *zai* or *zhe*, as is shown in (26). This is because the output translation of the combination of *zai*/*zhe* with a VP is of type <i,t>, which is exactly the type that *hui* 'will/would' requires.

(26) a. (Wangshang) ni hui-bu-hui hai zai jia-ban?
night you will-not-will still Prog work-overtime
'Will you be still working overtime at night?'
b. Qiang shang hui gua-zhe yi-fu hua
Wall on will hang-Asp one-Cl picture
'There will be a picture hanging on the wall.'

A consequence of the above analysis is that the future modal *hui* 'will/would' is predicted to be always incompatible with a perfective aspect under its scope, including the default perfective aspect, because the output translation of the combination of a VP and the default perfective aspect is of type <i,<i,t>>, too. This then predicts that the viewpoint aspect of sentences like those in (27) cannot be perfective.

(27) Wo (xiawu) hui xiuli yi-bu che
I afternoon will fix one-Cl car
'I will fix a car (this afternoon).'

If the viewpoint aspect of (27) is not perfective, what is it then? As a first step to answer this question, let us consider the following dialogue:

(28) A: Ni xiawu hui zuo shenme?
you afternoon will do what
'What will you do in the afternoon?'
B: Wo xiawu hui xiuli yi-bu chezi
I afternoon will fix one-Cl car
'I will fix a car in the afternoon.'
A: Si dian deshihou ni hui hai zai xiu che ma?
four o'clock when you will still Prog fix car Q
'Will you be still fixing the car at four o'clock?'
B': Shi-de, na-bu che yuji yao xiu san tian
yes that-Cl car estimated need fix three day
'Yes, it is estimated that the fixing of the car will last three days.'
B": Bu, wo yugu xiu dao san dian keyi wancheng,
No I estimate fix until three o'clock may complete
si dian yinggai yijing xiu-hao-le
four o'clock should already fix-complete
'I estimate that I will finish fixing it at three o'clock. It should have been fixed by four o'clock.'

The questions and answers in (28) show that a future statement such as (28B) may present an open situation. The speaker may intend the future event to be an incomplete (on-going) event as (28B') indicates or a complete event as (28B") indicates. In fact, it seems quite appropriate to translate (28B) as "I will be engaged in fixing a car in the afternoon', leaving achievement of the goal of the event open. If the viewpoint aspect of (27) is not absolutely perfective, what is it then? I propose that (27) has a neutral viewpoint aspect in the sense of Smith (1997). According to Smith (1997), the neutral viewpoint aspect involves the initial point of an eventuality and part of its internal stage but not the end point. It is neither perfective nor imperfective but is aspectually vague, allowing both closed and open interpretations. (27) seems to have exactly such interpretational flexibility. I will adopt Pancheva's (2003) formal definition of Smith's (1997) notion of neutral viewpoint aspect as given below.

(29) Neutral aspect = $\lambda P_{<i,t>}\lambda i \exists t[i \vdash t \,\&\, P(t)]$, where $i \in I$, the set of temporal intervals, $i \vdash i'$ iff $i \cap i' \neq \emptyset \,\&\, \exists t[\, t \in i \,\&\, t \notin i' \,\&\, \forall t' [t' \in i' \rightarrow t < t']]$

If the above analysis is right, it is even possible to replace the imperfective aspect in (24) by the neutral aspect in (29). This will make it possible to claim that the aspect under the scope of *hui* 'will' is always the neutral aspect, if no overt aspectual marker

is present.[14]

2. 5 Concluding remarks

In this section, I have shown that no matter which of the four factors—temporal adverbials, viewpoint aspect, aspect markers or the future modal *hui* 'will', is involved in interpreting the temporal location of an event, there is no need to postulate covert semantic features such as [+past] under an empty Tense node. Therefore, apart from the lack of morphological tense, it is reasonable to say that Chinese lacks semantic tense under a syntactic tense node, parallel to English ones. This weakens the possible claim that Chinese has empty tense node in syntax.

However, if semantic tenses are simply understood as ordering relations between time spans, Chinese can be said to have them but they are sometimes fused with the aspect. Normally, aspects are understood as expressing the inclusion relation $\subseteq$ (perfective) and $\supseteq$ (imperfective) between the event time and the topic time and tenses as the ordering relation between the topic time and the perspective time. In Chinese, the future relation > is expressed by *hui* 'will/would'. This element can be seen as a lexical semantic tense. In contrast, the past relation is contained in *le* and *guo*. However, *le* and *guo* contain both the inclusion and ordering relation. Two parts of the information are thus packed into one morpheme. So they can be said to be lexical semantic tense and semantic aspect at the same time. On the other hand, particles like *zhe* are pure aspect markers.

3. The Temporal Interpretation of Embedded Clauses

3.1 The case of English

The temporal interpretation of embedded tenses/clauses displays interesting properties. Consider the English sentence (30), where a past tense is subordinated to another past tense.

(30) John said that Mary was pregnant.
  a. John said, "Mary is pregnant".
  b. John said, "Mary was pregnant".
  c. John said, "Mary will be pregnant".

(30) has two distinct temporal readings. The time of the event described by the

[14] My view here is different from Smith (1997) in that she claims that the neutral aspect is associated with every sentence with no overt aspectual markers. I claim that the neutral aspect appears only under the scope of *hui* 'will'. The rule of Default Aspect will take care of the other cases.

embedded clause *Mary was pregnant* may be simultaneous with or prior to the time of the matrix event. The first reading is equivalent to what (30a) expresses and is sometimes called the simultaneous reading. This reading seems to be derived by converting the present tense of the direct quotation into the past tense in the indirect quotation and is known as the sequence of tense phenomenon in the literature. The simultaneous reading is often claimed to be possible only with embedded stative predicates (Enç (1987); Ogihara (1989); Stowell (1993); Gennari (2003).[15] The second reading is equivalent to what (30b) expresses and is often referred to as the backward-shifted reading. However, (30) does not have a reading on which the time of the embedded event follows the time of the matrix event. That is, (30) cannot be equivalent to what (30c) says. This impossible reading is sometimes referred to as the forward-shifted reading.

In contrast to a past tense, if a present tense is c-commanded by a past tense, the event time of the embedded clause has to coincide not only with the matrix event time but with the speech time. This is illustrated in (31).

(31) John said that Mary is pregnant.

Such a reading is referred to as the double-access reading in the literature.

In the above examples, we have a complement clause embedded in an attitude report verb. It has been pointed out that tenses in relative clauses behave differently from tenses in complement clauses. According to Ogihara (1989, 1996), just like the past tense in a complement clause, the past tense of a relative clause can be understood as simultaneous with a higher dominating tense, displaying a sequence of tense phenomenon. This is illustrated by (32), where the time of the fish being alive can be understood as simultaneous with a future buying time.

(32) John said that he would buy a fish that was alive.

However, Enç (1987), Abusch (1988, 1994, 1997), and Ogihara (1989, 1996) also have observed that tenses in relative clauses differ from tenses in complement clauses in some ways. First, unlike tenses in complement clauses, tenses in relative clauses can have a forward-shifted reading. For example, in (33), the woman could win the Noble Prize after she married with John.

(33) John married a woman who became a Noble Prize winner.

[15] However, see Kusumoto (1999) for some counterexamples, which have a clear restriction on them.

Second, when a present tense in a relative clause is embedded under a past tense as in (34), there is no effect of obligatory double-access. The embedded event in (34) only needs to be co-temporal with the speech time.

(34) John talked to a woman who is crying.

As we saw above, English resorts to different tense morphology to express the simultaneous reading, the backward-shifted reading and the double-access reading. These different readings are meant by the above-mentioned authors to stand for distinct semantic analyses rather than mere ways of describing the common sense inferences which arise in different situations. In contrast to English, Chinese lacks inflectional morphology to indicate tenses. It is therefore interesting to see what kind of temporal readings Chinese embedded clauses may get. Does it also have the three different readings which need three different semantic analyses? In what follows, I will show that Chinese complement clauses also display three interpretations. However, what might look like distinct interpretations are actually not semantically distinct. In particular, I will show that the superficially double-access-like interpretation in Chinese is actually the simultaneous reading plus pragmatic inferences and the backward shifted interpretation is the result of the use of an overt or covert temporal adverbial. So in what follows, I will distinguish the term "reading", which is equivalent to a semantic analysis, from the term "interpretation", which may refer to possible pragmatic inferences arising in different situations. Thus, one reading (semantic analysis) may have various interpretations depending upon the contexts involved.

3. 2. The case of Chinese embedded clauses

In this section, I will first review the temporal interpretation of complement clauses in Chinese and then the temporal interpretation of relative clauses.

3.2.1 The temporal interpretation of complement clauses

I will discuss the different interpretations of complement clauses on the basis of (i) whether the embedded predicate is an individual-level predicate or a stage-level predicate, (ii) whether the temporal adverbial is in the matrix clause or in the embedded clause and (iii) whether the embedded clause contains an overt aspectual marker.

To begin with, consider the sentences in (35).

(35) a. Yuehan shuo Mali hen piaoliang
John say Mary very beautiful
b. Huiying shuo ta hen jinzhang/mang
Huiying say she very nervous/busy

In both (35a) and (35b), the matrix and embedded clauses do not contain any temporal adverb or aspectual marker. The embedded predicate in (35a) is an individual-level predicate, whereas the embedded predicate in (35b) is a stage-level predicate. The most natural interpretation of (35a) is that the embedded predicate is true of the saying time as well as the speech time. This should be the case, because individual-level properties do not change over time easily.

Next consider (35b). Uttered out-of-the-blue, (35b) doesn't seem to have the backward-shifted interpretation, unless the context of utterance has a pre-established reference time for the embedded clause as in (36a) or an overt temporal adverbial is present in the embedded clause as in (36b).

(36) a. Speaker A: Ni zhidao Yuehan zuotian kaoshi de qingxing ma?
you know John yesterday exam DE situation Q
'Do you know how John's test the day before yesterday was?'
Speaker B: Yuehan shuo ta hen jinzhang
John say he very nervous
'John said that he was nervous.'
b. Huiying shuo Xiujia zuotian hen mang
Huiying say Xiujia yesterday very busy
'Huiying said that Xiujia was very busy yesterday.'

Like the backward-shifted interpretation of (35b), the pure simultaneous interpretation of (35b) needs support of a pre-established reference time or an overt temporal adverbial. What is different is that in the simultaneous interpretation, the pre-established reference time or the temporal adverbial is part of the matrix clause rather than the embedded clause. This is illustrated by (37).

(37) Ganggang zai dengdai miantan deshihou Yuehan shuo ta hen
just-now Prog wait-for interview while John say he very
jinzhang
nervous
'While John was waiting for the interview a moment ago, he said he was very

nervous.'

It is worth noting that in (38) though the temporal adverbial is placed in the matrix clause, it is interpreted as if it were also in the embedded clause. Thus, (37) is interpreted as almost equivalent to: John said that he was nervous at the waiting interval.

The only interpretation of (35b) that does not need a pre-established reference time or an overt temporal adverbial is the one on which the complement clause is true at both the saying time and the speech time. For example, (38) can be uttered out-of-the-blue to initiate a discourse and obtain an interpretation which is close to the English double-access reading.

(38) Yuehan shuo ta hen mang, jiao women bu yao chao ta
Yuehan say he very busy ask us not want bother him
'John said that he was busy and asked us not to bother him.'

In Chinese when the matrix verb *shuo* 'say' is not modified by an overt temporal adverbial as in (38), it implies that the saying time is relatively close to the speech time. This makes it more likely that the reported state still holds at the speech time if what is said is true, because states usually take time to obtain. In contrast, if the saying/attitude time is not close to the speech time, an overt temporal adverbial is required in the matrix clause as is illustrated in (39). In such cases, the likelihood of the actual temporal persistence of the reported state is lower, though this possibility is not excluded.

(39) Yuehan san tien qian shuo ta hen mang, jiao wo bu yao
Yuehan three day ago say he very busy ask me not want
chao ta
bother him
'John said three days ago that he was busy and asked me not to bother him.'

Still another factor that may determine whether or not the truth interval of a reported state overlaps the speech time is the nature of the stative predicates. Stage-level predicates which denote longer event duration are more likely to overlap the speech time. For instance, (40) implies that the truth interval of the state complement overlaps the speech time even though the subject's saying time is relatively far away from the speech time.

(40) Lisi san tian qian gen wo shuo Mali yinwei shenti bu hao
Lisi three day agao to me say Mary because body not good
hen tongku
very painful
'Lisi told me three days ago that Mary was very painful because of her bad health.'

Normally, bad health lasts for a period of time and is quite unlikely to change within three days. Therefore, (40) tends to imply that if what is said is true, the truth interval of the reported state overlaps the speech time, though this interpretation is not forced.

The above discussion indicates that if a reported state is true, then whether or not it is still true at the speech time is largely influenced by the properties of the embedded predicate such as the possible duration of the state. This suggests that the probability of the seemingly double-access interpretation in Chinese can be thought of as a (non-absolute) scale, the extreme case being the individual-level predicates, which denote more or less permanent properties. If this observation is correct, it suggests that Chinese has no true double-access reading. The superficially double-access-like interpretation is pragmatically determined rather than being grammatically encoded. This interpretation is derived from the simultaneous reading plus pragmatic reasoning associated with the embedded predicate.

In addition to the factors discussed above, the use of aspectual markers such as the verbal *le* or the experiential marker *guo* influences the temporal location of an embedded event. Two illustrating examples are given below.

(41) Lisi shuo quan cun de ren dou zhidao-le na-jian shi
Lisi say all villeage DE person all know-Asp that matter
'Lisi said that the people of the whole village had known the matter.'
(42) Yuehan shuo Mali sheng-guo qi
John say Mary get-Asp angry
'John said that Mary was angry (before the saying time).'

The use of *guo* in (42) indicates not only that the time of getting angry is before the saying time but also that the ensuing state of being angry no longer holds at that time. In contrast, though the use of *le* in (41) also indicates that the change of state occurred before the saying time, the resultant state is asserted to be still true at that time.

The final point about the temporal interpretation of complement clauses is that a complement clause has the simultaneous interpretation only when it describes a state.

When the embedded clause denotes an event, only the backward-shifted interpretation is possible. This seems to pattern with the English data.

(43) Yuehan shuo Mali dapuo huaping
John say Mary break vase
'John said that Mary had broken a vase.'

3.2.2 The temporal interpretation of the relative clause

As for the temporal interpretations of relative clauses, Chinese data also display some properties similar to those we have seen for English relative clauses, though there is no overt tense morphology in Chinese. For example, like the past tense in English relative clauses, the event time of a Chinese relative clause can be simultaneous with that of a higher clause. This is illustrated in (44), where the time of being alive is co-temporal with the time of buying.

(44) Yuehan shuo ta hui mai yi tiao huo de yu
John say he will buy one Cl alive Rel fish
'John said that he would buy a fish that was alive.'

Also like English relative clauses, Chinese relative clauses may allow the forward-shifted interpretation, in addition to the backward-shifted interpretation as in (45). That is, the time of the journalist's writing that article can be after the time of hiring him.

(45) Shi shei guyong-(le) na-wei xie zhe-pian wenzhang de jizhe?
be who hire-Asp that-Cl write this-Cl article Rel journalist
'Who hired the journalist who wrote that article?'

In Chinese, we can also find examples where the relative clause is understood as being true at the speech time without it also being true at the past matrix event time as shown in (46). Interestingly, however, if the demonstrative *na* 'that'in (46) is replaced with the numeral *yi* 'one', the relative clause must be understood as denoting a past event which is simultaneous with the time of the matrix event, as is illustrated in (47).

(46) Wo jian-guo na-wei zai ku de nanhai
I mee-Asp that-Cl Prog cry Rel boy
'I met that boy who is crying.'

(47) Wo jian-guo yi-wei zai ku de nanhai
I meet-Asp one-Cl prog cry Rel boy
'I met a boy who was crying.'

4. Previous Analyses of Sequence of Tense

The data of sequence of tense in English have led many researchers to think that embedded past tenses are different from matrix past tenses in that they can be semantically vacuous (Ogihara 1989, 1995, 1996; Stowell 1993, 1996; Abusch 1994, 1997; Heim 1994; von Stechow 1995a,b; Kratzer 1998). These authors all agree that the embedded clauses of propositional attitude verbs denote properties of times, which necessarily yields the simultaneous interpretation when combined with a proper analysis of attitude verbs. I will here summarize Ogihara's theory as a representative.

Ogihara (1989, 1995, 1996) has proposed the Sequence of Tense rule (The SOT rule), which says that if a tense, be it present or past, is locally c-commanded by another tense of the same feature at LF, it can be optionally deleted. When it is deleted, the simultaneous reading arises; when it is not, the shifted reading obtains. Take (30) as an example. It has two LFs, depending on whether or not the SOT rule has applied.

(48) a. [John Past say [Mary ∅ be present]]
a' $\exists t[t < s^* \ \& \ \text{say'}(t, j, \wedge \lambda t \lambda x[\text{be-pregnant'}(t,m)])]$
b. [John Past say [Mary Past be pregnant]]
b' $\exists t[t < s^* \ \& \ \text{say'}(t, j, \wedge \lambda t_2 \lambda x \exists t_1[t_1 < t_2 \ \& \ \text{be-pregnant'}(t_1,m)])]$

However, as repeatedly pointed out, this analysis fails to explain the contrast between stative and eventive clauses. While embedded stative clauses may have a simultaneous reading, eventive clauses do not have such a reading (Portner 2003 and Gennari 2003, for example).

In contrast to the previous author's non-uniform approach to tense meanings, Gennari (2003) has proposed uniform definitions of tense meanings across contexts. She suggests that the exact duration and location of the interval at which a sentence is true are determined by lexical tense meanings and lexical/sentential aktionsart rather than by language specific mechanism such as the Sequence of Tense rule. On her analysis, the distinction between stative and eventive clauses comes from the assumption that stative sentences have a temporal superinterval property that eventive sentences lack. More precisely, according to her, when states are asserted, they are normally true not only at the event time but at a larger interval surrounding the event

time or the reference time of the clause. The duration and choice of the superinterval are often subject to pragmatic considerations. Again, take the sentence *John said that Mary was pregnant* for example. On the assumption that a past tense denotes a relation according to which the asserted event time, i.e., the time specified by the tense operator, precedes the local evaluation time, the sentence under discussion gets a backward-shifted reading. However, because the embedded clause is a state, due to the superinterval property, the state can be true at a larger interval surrounding the asserted event time, i.e., it is possible for the superinterval of being pregnant to extend from a time earlier than the saying time until the saying time itself, deriving the simultaneous reading.

As pointed out to me by Paul Portner and one reviewer, Gennari's analysis of tenses are quite unlikely to be correct, because states have the subinterval property rather than the superinterval property. For example, if John is at home from 5 to 7, it does not follow that he is at home for a longer time. But it follows that he is at home from 5 to 6. So Gennari's superinterval property must be wrong.

Likewise, the following two sentences provided to me by Paul Portner are against the superinterval property.

(49) a. All of a sudden, John felt that Mary was touching his arm.
b. Mary believed that her baby was cute.

(49a) does not require that Mary touch John's arm for a while before he starts to feel it and (49b) does not require that the baby start being cute before Mary begins to believe it. She can believe he is cute from the moment he's conceived.

Another recent analysis of sequence of tense is given by Portner (2003), who also resorts to aktionsart properties to explain the overlap or shifted reading of embedded clauses. He has observed that the overlap or non-overlap interpretation is not a phenomenon unique to embedded clauses but can be found in the perfect and temporal sequencing in discourse as well. For example, the temporal interpretations of the following two perfect sentences are sensitive to the eventive vs. stative distinction.

(50) a. Mary has read Middlemarch.
b. Mary has been upset (lately). (Portner 2003: 481)

In (50a), the time of the reading event must precede the speech time, whereas in (50b) the state of Mary being upset may either precede or overlap the speech time. The interpretation of (50a) is the same one as we find in the sentence *John said that Mary*

read Middlemarch and the interpretation of (50b) is the same one as we find in *John said that Mary was upset*.

Given the similarity between the perfect, sequence of tense, and temporal sequencing in discourse, Portner argues that the simultaneous or shifted reading is not a consequence of whether a semantically past tense is present or absent but is due to independent factors. He assumes that a past tense morpheme always deletes when it is embedded under another. In other words, embedded clauses are always semantically tenseless, just as a phrase embedded under the perfect operator is. He proposes the following Temporal Sequencing Principle.[16]

(51) For any tenseless clause ϕ, reference time r, and event e,
(i) if ϕ is not stative: $||\phi||^{r,e}$ implies that e precedes r; and
(ii) if ϕ is stative: $||\phi||^{r,e}$ implies that e either precedes or overlaps r.

Portner's analysis of sequence of tense is very attractive in that it unifies three superficially different temporal phenomena under the same temporal sequencing principle. Attractive though the Temporal Sequencing Principle is, as I will explain later, it cannot be directly applied to the Chinese data.

5. An Analysis of the Temporal Interpretation of Complement Clauses

In the last section, I briefly reviewed three current theories of embedded tenses and showed how they tackle the temporal interpretation of complement clauses in English. Can any of the three contemporary theories of sequence of tense be extended to account for the temporal interpretation of complement clauses in Chinese? Let us look at Ogihara's theory first. If the conclusion that Chinese does not have a tense projection is correct, the kind of theory that Ogihara has proposed or any other similar theory such as Abusch's is inapplicable to Chinese, because Chinese lacks tense morphemes or semantic tenses in the very beginning.

Gennari's proposal might have a chance to be extended to Chinese, given that her account is mainly based on the aktionsart properties and pragmatics of the embedded predicates. However, as noted, the proposed superinterval property seems problematic. Stative predicates have the subinterval rather than the superinterval property.

The remaining candidate is Portner's proposal. His treatment of embedded clauses as being tenseless makes it very tempting to try to extend his analysis of

[16] (51) is a simplified version of Portner's (2003: 484) Temporal Sequencing Principle, which does not take temporal sequencing in discourse into consideration. For a more complete analysis of temporal sequencing, see Portner (2003) for details.

English to Chinese, because the latter is a tenseless language. Indeed, if the Temporal Sequencing Principle as stated in (51) can be directly applied to the Chinese data, his analysis can be said to gain further support from cross-linguistic data. However, there is a problem with extending his analysis to Chinese. As noted, in Chinese when an embedded predicate is a stative one, the embedded clause has the simultaneous reading but not the shifted reading unless an overt temporal adverbial is present in the embedded clause or a covert one can be inferred from the context. However, the Temporal Sequencing Principle in (51) predicts that Chinese embedded stative clauses without a temporal adverbial should have a backward-shifted reading just like their English counterparts. This prediction is not correct. To rescue this, perhaps one might suggest that the precedence condition be left out from (51). This will not work, however, because leaving out the precedence condition will make an embedded stative clause with an overt temporal adverbial run into problems. Such clauses do allow backward-shifted interpretation. In view of this, I would like to pursue a different approach to the temporal interpretation of complement clauses in Chinese. I will argue that the information provided by Asp in the embedded clause, plus the semantics of the matrix attitude verb, is sufficient to determine the simultaneous reading of an embedded stative clause. The other possible interpretations are the products of the use of an overt or covert temporal adverbial or pragmatic reasoning.

To begin with, I would like to make a remark on the matrix verb *shuo* 'say', because all the examples I discussed earlier involve this verb. When this verb is followed by a CP complement, the matrix VP constitutes a telic predicate, because the CP complement measures out the matrix VP (Zagona (to appear)). Therefore, by the definition of default aspect, the default viewpoint aspect of a matrix clause with the verb *shuo* 'say' is perfective. It follows from this that the matrix clause gets a past interpretation.

Now that we know how matrix clauses are temporally interpreted, we turn now to the temporal interpretation of complement clauses. First consider a case where the embedded predicate is an individual-level predicate such as the sentence *Yuehan shuo Mali hen piaoliang* 'John said that Mary was beautiful' in (35a). As noted, the out-of-the-blue interpretation of this sentence is that the property of being beautiful holds true not only at John's saying time, but at the speech time as well. According to the earlier discussion about default aspect, the viewpoint aspect of the embedded clause in (35a) is imperfective. If we assume a semantics of attitude verbs like the one given in (52) for the verb *shuo* 'say', then the logical form of (35a) is (53).

(52) For any $w_0 \in W$, $P_0 \in D<s,<i,t>>$, $a_0 \in A$ and $t_0 \in T$, $[[\text{shuo'}]]_{w0}(P_0)(a_0)(t_0) = 1$ iff for all world w and time t compatible with what a_0 believes in w_0 at t_0, $P_0(w)(t)$.

(53) $\exists t_{Top} \exists t[t \subseteq t_{Top} \wedge t_{Top} < s^* \wedge \text{say'}(t, j, \hat{}\lambda t_{Top} \exists t'[t_{Top} \, O \, t' \wedge \text{beautiful'}(t', m)])]$

According to (53), (35a) is true if and only if in the actual world John's saying time is before the speech time and for all the worlds *w* and time *t* compatible with John's beliefs at his saying interval in the actual world, the state of Mary's being beautiful overlaps the time *t* in the world *w*. Thus, if John's saying interval in (53) is part of the world-time pairs compatible with his cognitive state, it follows that Mary is beautiful at an interval overlapping John's saying interval. As noted, however, (35a) implies that the state of Mary's being beautiful is true not only at the interval of John's saying interval but also at the speech time. How do we explain this fact? I think that the implication is a mere inference derived from the pragmatics of individual-level predicates and no formal mechanism is required to explain it as the double-access reading in English requires. This inference holds because individual-level predicates such as *piaoliang* 'beautiful' normally do not change over time easily. This reasoning is supported by the fact that the English sentence below may have the same kind of inference even if the embedded clause has a past tense morphology.

(54) John said that Mary was beautiful.

The pragmatic reasoning under discussion will become even clearer when stage-level predicates are considered. In any case, (35a) is a very good example illustrating how the properties of an embedded predicate influence the temporal interpretation of a complement clause.

Next, let us consider (35b), where the embedded predicate is a stage-level predicate. According to the analysis proposed above, the logical form of (35b) is no different from that of (35a). The logical form of (35b) is (55).

(55) $\exists t_{Top} \exists t[t \subseteq t_{Top} \wedge t_{Top} < s^* \wedge \text{say'}(t, j, \hat{}\lambda t_{Top} \exists t'[t_{Top} \, O \, t') \wedge \text{busy'}(t', m)])]$

As noted, however, the temporal interpretation of a complement clause with a stage-level predicate is more context-sensitive than the temporal interpretation of a complement clause with an individual-level predicate. According to my earlier discussion, such sentences have various interpretations, including the double-access interpretation, the backward-shifted interpretation and the simultaneous interpretation. Which interpretation is intended depends upon the nature of the embedded predicate,

the distance between the attitude time and the speech time and contextual support of temporal adverbials. I will discuss these different interpretations in turn.

First, consider (38), reproduced below. This sentence can be used to initiate a discourse. Thus, there is no pre-established reference time available. Nor does the matrix clause or the embedded clause contain an overt temporal adverbial. The most natural interpretation of the first sentence in (38) is one on which the embedded proposition is true at the speech time as well as the saying time.

(38) Yuehan shuo ta hen mang, jiao women bu yao chao ta
Yuehan say he very busy ask us not want bother him
'John said that he was busy and asked us not to bother him.'

How is this interpretation derived? The truth conditions in (55) require that the saying interval overlaps the busy interval. However, this does not entail that the busy interval must extend from the saying interval to the speech time. What then forces the double-access-like interpretation of the first half of (38)? As noted, when the matrix clause does not have a covert or overt temporal modifier, the implication is that the saying time is close to the speech time. This, together with the world knowledge that when a person is busy, he is usually busy for some period of time, then implies that at the speech time, the property of being busy should hold true. Such an implication is further reinforced by the causal relation between the first and the second sentence. In the second half of (38), the speaker is informing the hearer of John's request not to bother him. Since this request is transmitted to the hearer at the speech time, this means that the request should be obeyed at the speech time. From this, it can be inferred that John is still busy at the speech time, because being busy is the cause of the request. I conclude that the interpretation that (38) displays is different from the true double-access reading as we saw in English. The interpretation that (38) displays is the simultaneous reading, but the distance between the attitude time and the speech time and the interaction between sentences in the discourse may force the sentence to imply that the reported state is still true at the speech time.

That the double-access-like interpretation of (38) is a matter of pragmatics inference is further supported by (56), which differs from (38) only on the part of the second half of the sentence.

(56) Yuehan shuo ta hen mang, suoyi zuotian mei kong lai
Yuehan say he very busy so yesterday not free come
'John said that he was busy, so he was not free to come yesterday.'

In (56), due to the temporal adverbial *zuotian* 'yesterday', the second half of the sentence is about a past state. This past state is causally related to the complement state of the first sentence. Due to this causal relation, it is inferred that the complement state must hold at the time denoted by the temporal adverbial in the second clause. As a consequence, (56) is most naturally construed as the backward-shifted interpretation rather than the double-access-like interpretation.

The pure simultaneous interpretation of a complement clause with a stage-level predicate is illustrated by (37), discussed earlier. In (37) we have a temporal adverbial in the matrix clause. The truth conditions of (37) assert that the saying interval which is included within the waiting interval overlaps the nervous interval. From this it can be inferred that the property of being nervous must hold true at the waiting interval. In other words, the fact that a matrix temporal modifier is interpreted as if it also modifies the embedded clause is actually an artifact derivable from the overlapping relation between the attitude interval and the embedded state interval. Moreover, the world knowledge tells us that the interval of being nervous would most naturally extend from the waiting interval to the interview interval and would normally not continue after the interview, because people usually become relaxed when the cause of nervousness disappears. This then implies that the interval of being nervous does not include the speech time, because the speech time is after the interview, i.e., the cause of nervousness.

Although I will not discuss other examples such as (39) and (40) in detail, they point to the same conclusion as above.

To sum up, complement clauses with a stative predicate have the simultaneous interpretation as is required by the information provided by Asp in the embedded clause and the semantics of attitude verbs. However, people's world knowledge about the property of an embedded predicate and other contextual support such as the interaction between sentences in a discourse may cause the reported state to obtain a double-access-like interpretation. On the other hand, the use of an overt temporal adverbial in the complement clause or contextual inference of such a temporal adverbial gives the complement clause a backward-shifted interpretation.

Before proceeding to the temporal interpretation of relative clauses, I briefly discuss how a complement clause with an eventive predicate is temporally interpreted. Consider the sentence *Yuehan shuo Mali dapuo huaping* 'John said that Mary broke a vase' in (43) again. In this sentence, the embedded clause does not have any aspectual marker. Therefore, its viewpoint aspect is determined by Default Aspect, which is perfective by definition. Accordingly, the logical form of (43) is (57).

(57) $\exists t_{Top1} \exists t[t \subseteq t_{Top1} \wedge t_{Top1} < s^* \wedge say'(t, j, \hat{}\lambda t_0 \exists t_{Top2} \exists t' \exists x[t' \subseteq t_{Top2} \wedge t_{Top2} < t_0 \wedge break'(t', j, x) \wedge vase(x)]]$

The truth conditions in (57) say that (43) is true iff there is a past event of John's saying and for all his cognitive worlds *w* and time *t* compatible with his beliefs at the saying interval in the actual world, Mary breaks a vase at a time earlier than t_0. Since t_0 is the attitude time, this means that the breaking time must precede the saying time, if what is said is true, thus deriving the backward shifted reading.

6. An Analysis of the Temporal Interpretation of Relative Clauses

Recall that we discussed (46) and (47), reproduced below, where the aspectual viewpoint of the relative clause is imperfective.

(46) Wo jian-guo na-wei zai ku de nanhai
I mee-Asp that-Cl Prog cry Rel boy
'I met that boy who is/was crying.'

(47) Wo jian-guo yi-wei zai ku de nanhai
I meet-Asp one-Cl Prog cry Rel boy
'I met a boy who was crying.'

(46) and (47) are almost identical in every respect except for the determiner that modifies the object NP. In (46) we have a definite demonstrative determiner, whereas in (47) we have an indefinite numeral determiner. As noted, this difference results in a different temporal interpretation. When a relative clause is contained in an indefinite NP, the time of the event denoted by the relative clause must be simultaneous with the time of the matrix event. In other words, the event time of the relative clause is temporally dependent upon the event time of the matrix clause. In contrast, when a relative clause is contained in a definite NP, it can easily receive a present interpretation regardless of the past interpretation of the matrix clause. This interpretation is available when the demonstrative determiner *na* 'that' is interpreted deictically. When it has an anaphoric interpretation, the event time of the relative clause must refer to a contextually determined past time. Examples like (46) and (47) clearly show that the temporal interpretation of an imperfective relative clause is sensitive to the choice of a definite or indefinite determiner.

Although the choice of different determiners may influence the temporal interpretation of relative clauses, the use of an overt temporal adverbial may override the effect of the determiner. For example, compare (58) with (59). (58) only has the

dependent reading on which the time of washing overlaps the time of arguing. The temporally independent later-than-the-matrix interpretation is impossible. In contrast, in (59), with the temporal adverbial *xianzai* 'now' inserted to the relative clause, the temporally independent interpretation is easy to get.

(58) Yuehan zuotian han yiwei zai xi yifu de nühai chaojia
John yesterday with one Prog wash cloth Rel girl argue
'Yesterday John argued with a girl who was washing clothes.'

(59) Yuehan zuotian han yiwei xianzai zai (he bien) xi yifu
John yesterday with one now Prog river bank wash cloth
de nühai chaojia
Rel girl argue
'Yesterday John argued with a girl who is now washing clothes (over the river bank) now.'

Unlike imperfective relative clauses, a perfective relative clause without an overt temporal adverbial allows both the temporally dependent and independent interpretation irrespective of the choice of determiners. Therefore, examples such as (60) are ambiguous between the earlier-than-the-matrix and the later-than-the-matrix interpretation regardless of the definiteness of the determiner.

(60) Mali jia-gei-(le) yi-wei/na-wei huode nuobeier jiang de kexuejia
Mary marry-to-Asp one-Cl/that-Cl get Nobel prize Rel scientist
'Mary married with a scientist that got a Nobel Prize (before or after the marriage).'

To sum up, the generalizations of the temporal interpretation of relative clauses in Chinese are:

(A) When the NP to which a relative clause is embedded is a definite:
The temporal interpretation of the relative clause is influenced by the deictic vs. anaphoric interpretation of the definite determiner.

(B) When the NP to which a relative clause is embedded is an indefinite:
(i) An imperfective relative clause is temporally dependent upon the matrix event time.
(ii) A perfective relative clause is temporally independent of the matrix event time.

(C) When a relative clause contains an overt temporal adverbial, the temporal

specification of that adverbial overrides the effects of determiners and viewpoint aspect.

6.1 Analysis

Before explaining how the temporal interpretation of relative clauses is determined, I would like to first make some of my assumptions clear. To begin with, as noted earlier, I assume that predicates have an additional argument for time and hence transitive verbs such as *mai* 'buy' translate as expressions of type <*e*,<*e*,<*i*,*t*>>>. Secondly, I assume the VP-internal subject hypothesis according to which the subject DP has to move to the specifier position of IP, leaving a trace behind. Thirdly, indefinites may undergo quantifier raising (QR) to obtain their scope and can be adjoined to either VP or IP. Finally, I assume that Chinese relative clauses are interpreted in formal semantics as properties and the semantic denotation of a head noun modified by a relative clause is obtained through Heim and Kratzer' (1998) predicate modification. In Heim and Kratzer's original proposal, time arguments are not taken into consideration. Kusumoto (1999) and Ogihara (1996, 2004) have extended their analysis to a framework with time as an argument of a predicate as shown in (61).

(61) Predicate Modification (à la Heim and Kratzer (1998))
$\| [_{NP}[_{Rel}\ldots][_{NP}\ldots]] \| = \lambda x.\lambda t.\| [_{Rel}\ldots] \|(x)(t) = \| [_{NP}\ldots] \|(x)(t) = 1$

With the above assumptions in mind, let us now discuss how the definite and indefinite determiners influence the temporal interpretation of relative clauses. As noted, when a relative clause is embedded in a NP with a definite demonstrative, its temporal interpretation varies with the deictic vs. anaphoric interpretation of the demonstrative. Consider the deictic interpretation first. This interpretation requires that the event time of an imperfective relative clause overlap the speech time, and that the event time of a perfective relative clause precede the speech time. In other words, when a demonstrative determiner is deictic, the utterance time is the evaluation time of the relative clause no matter whether the viewpoint aspect is perfective or imperfective. This is not surprising. The function of a deictic determiner is to refer to something close to the speaker's here-and-now. Thus, I propose that in addition to its referring function, a deictic demonstrative contains a time variable in its denotation that is identified with the speech time and serves as the time argument of the common noun and the evaluation time of the relative clause. Thus, a deictic DP such as *na-wei nanhai* 'that boy' is roughly interpreted as 'the boy who is temporally located at the speech time that I am pointing at'. More precisely, a deictic determiner such as *na*

'that', written as na_D, translates as (62).

(62) $||na_D|| = \lambda P_{<e,<i,t>>}.\iota x.\exists t[P(x)(t) \wedge t = s^*]$ or $\lambda P_{<e,<i,t>>}.\iota x.[P(x)(s^*)]$

It follows from this and the Predicate Modification rule that *na-wei zai ku de nanhai* 'that boy who is crying' in (60) translates as (63).

(63) 1. $|||[_{NP}$ nanhai $]|| = \lambda x.\lambda t.boy'(x)(t)$

2. $|||[_{CP}\ [_{IP[imperfective]}$ zai $[_{VP}\ e_i$ ku$]]$ de$]|| = \lambda x.\lambda t_{Top}\exists t[t_{Top}\ O\ t \wedge$ cry'$(x)(t)]$

3. $|||[_{NP}[_{CP}\ldots][_{NP}\ldots]]|| = \lambda x.\lambda t_1.\exists t[t_1\ O\ t \wedge$ cry'$(x)(t) \wedge$ boy'$(x)(t_1)]$ (by predicate modification)

4. $||$na-wei$|| = \lambda P_{<e,<i,t>>}.\iota x[P(x)(s^*)]$

5. $|||[_{DP}$na-wei zai ku de nanhai$]|| = \lambda P_{<e,<i,t>>}.\iota x[P(x)(s^*)](\lambda x.\lambda t_1.\exists t[t_1\ O\ t \wedge$ cry'$(x)(t) \wedge$ boy'$(x)(t_1)])$
$= \iota x\exists t[s^*\ O\ t \wedge$ cry'$(x)(t) \wedge$ boy'$(x)(s^*)]$

This explains the present interpretation of an imperfective relative clause embedded in a deictic demonstrative. Similar remarks apply to (60), where the relative clause is perfective. When the definite demonstrative in (60) is construed deictically, the award of the Nobel Prize must be given prior to the speech time. This in turn allows two possibilities, namely, the award of the Nobel Prize is before the marriage or later than the marriage. Indeed, (60) is ambiguous between these two interpretations.

As for the anaphoric demonstrative, it is well-known that the use of an anaphoric article presupposes familiarity of the property associated with the article. In order for a property to be familiar, it must be introduced earlier in the discourse. This then suggests that the anaphoric interpretation of a demonstrative is associated with a temporal argument that is bound by a time contextually determined in the discourse. In view of this, I propose that the anaphoric demonstrative, annotated as na_A, has the following denotation.

(64) $||na_A|| = \lambda P_{<e,<i,t>>}.\iota x.\exists t[P(x)(t) \wedge t = t_a]$, or $\lambda P_{<e,<i,t>>}.\iota x.[P(x)(t_a)]$,
where t_a is a time contextually determined by the discourse.

This explains the temporal interpretation of a relative clause embedded in an anaphoric demonstrative.

A reviewer pointed out to me that the parallel of the two rules in (62) and (64) suggests that they are one and the same rule, namely (64). In (64), nothing precise is said about the binding of the free anaphoric variable t_a. So the variable could refer to the speech time under special conditions. If this is true, the rule (62) is not needed.

Before moving on to relative clauses embedded in indefinite NPs, it is worth noting that it is not strange at all for a determiner to encode temporal information as proposed above. For example, Nordlinger & Sadler (2001) and Lecarme (2004) point out that tense morphemes in many languages show up precisely on definite articles. The proposed analysis of the definite demonstrative determiner in Chinese is therefore independently motivated in Universal Grammar.

Turning to relative clauses embedded in an indefinite NP, let us consider (60) first, where the relative clause is perfective. As noted, this sentence is ambiguous between the earlier-than-the-matrix and later-than-the-matrix interpretation. Why is it ambiguous? My answer will rely on Ogihara's (1996) idea that the scope of a relativized NP determines the temporal (in)dependence of the relative clause. According to him, when a relativized NP is QR-ed to a VP, it is within the scope of the tense of the verb. Therefore, the tense of the relative clause is temporally dependent on the tense of that verb. In contrast, when a relativized NP is QR-ed to IP, it is outside the scope of the tense of the verb. Therefore, the tense of the relative clause is temporally independent of the tense of that verb. Although Chinese does not have overt tense morphology, I propose that something similar applies.[17] When a QR-ed object NP is adjoined to VP within the scope of the matrix aspect, the matrix event time will be the reference time of the embedded aspect. When it is adjoined to IP outside the scope of the matrix aspect, the speech time will be the reference time of the embedded aspect. Therefore, Chinese sentences like (60) with an indefinite determiner are ambiguous. In (65) I illustrate the computation with the object NP adjoined to VP.

(65) LF: $[_{CP}[_{IP}$ Ta$_1$ $[_{Infl'}$ (le) $[_{VP2}[_{DP}$ yi-wei $[_{NP}[_{CP}$ huode nuobeier jang de] kexuejia]]]$_2$ $[[_{VP1}$

she Asp one-Cl get Nobel prize Rel scientist

e_1 jia-gei e_2]]]]]

marry-to

1. $\|VP_1\| = \lambda t.$marry-to'(2)(1)(t)
2. $\|[_{NP}$ kexuejia $]\| = \lambda x.\lambda t.$scientist'(x)(t)
3. $\|[_{CP}\ [_{IP}\ Asp_{[perfective]}\ [_{VP}$ huode nuobeier jiang]] de]$\| = \lambda x.\lambda t_{Top}\lambda t_0\exists t[t \subseteq t_{Top} \wedge t_{Top} < t_0 \wedge$ get-Nobel-prize'(x)(t)]
4. $\|[_{NP}[_{CP}\ldots][_{NP}\ldots]]\| = \lambda x.\lambda t_0\exists t_{Top}\exists t[t \subseteq t_{Top} \wedge t_{Top} < t_0 \wedge$ get-Nobel-Prize'(x)(t) $\wedge$ scientist(x)(t_0)] (Predicate Modification)
5. $\|[_{DP}\ldots[_{NP}[_{CP}\ldots][_{NP}\ldots]]]\| = \lambda P_{<e,<i,t>>}\lambda t_0\exists t_{Top}\exists t\exists x[t \subseteq t_{Top} \wedge t_{Top} < t_0 \wedge$ win-Nobel-prize'(x)(t) $\wedge$ scientist(x)(t_0) $\wedge$ P(x)(t_0)] (Generalized Quantifier)

[17] Kusumoto (1999) has argued that Ogihara's scope account is problematic because of examples containing NPI's. Space constraint prevents me from discussing this issue. Therefore, I refer the reader to Kusumoto (1999) for the arguments.

6. $\|[_{VP2}[[_{DP}\ldots][_{VP1}\ldots]]\| = \lambda P_{<e,<i,t>>}\lambda t_0 \exists t_{Top} \exists t \exists x[t \subseteq t_{Top} \wedge t_{Top} < t_0 \wedge$ win-Nobel-prize'$(x)(t) \wedge$ scientist$(x)(t_0) \wedge P(x)(t_0)](\lambda 2.\lambda t.$marry-to'$(2)(1)(t))$
$= \lambda t_0 \exists t_{Top} \exists t \exists x[t \subseteq t_{Top} \wedge t_{Top} < t_0 \wedge$ win-Nobel-prize'$(x)(t) \wedge$ scientist$(x)(t_0)$
$\wedge$ marry-to'$(x)(1)(t_0)]$ (Functional Application)

7. $\|$Asp$\| = \lambda P_{<s,t>} \lambda t_{Top'} \lambda t_1 \exists t_2[t_2 \subseteq t_{Top'} \wedge P(t_2) \wedge t_{Top'} < t_1]$

8. $\|$IP$\| = \lambda t_{Top'} \lambda t_1 \exists t_2[t_2 \subseteq t_{Top'} \wedge t_{Top'} < t_1 \wedge \exists t_{Top} \exists t \exists x[t \subseteq t_{Top} \wedge t_{Top} < t_2 \wedge$ win-Nobel-prize'$(x)(t) \wedge$ scientist$(x)(t_2) \wedge$ marry-to'$(x)($she'$)(t_2)]]$

9. $\|$CP$\| = \lambda t_1 \exists t_{Top'} \exists t_2[t_2 \subseteq t_{Top'} \wedge t_{Top'} < t_1 \wedge \exists t_{Top} \exists t \exists x[t \subseteq t_{Top} \wedge t_{Top} < t_2 \wedge$ win-Nobel-prize'$(x)(t) \wedge$ scientist$(x)(t_2) \wedge$ marry-to'$(x)($she'$)(t_2)]]$ Rule (7b)-Existential Closure

10 $\|$CP$\| = \exists t_{Top'} \exists t_2[t_2 \subseteq t_{Top'} \wedge t_{Top'} < s^* \wedge \exists t_{Top} \exists t \exists x[t \subseteq t_{Top} \wedge t_{Top} < t_2 \wedge$ win-Nobel-prize'$(x)(t) \wedge$ scientist$(x)(t_2) \wedge$ marry-to'$(x)($she'$)(t_2)]]$ by Default Speech Time

As we saw in line 6, when the QR-ed object NP is adjoined to VP, the event time of the matrix VP need to substitute the time t_0 after lambda conversion before the semantics of Aspect closes the event time variable. Since t_0 is the reference time of the relative clause, the matrix event time is identified with the reference time of the relative clause.

In contrast, when the QR-ed NP is adjoined to IP, by the time the QR-ed DP is combined with the IP, the event time variable of the matrix clause has already been closed by the semantics of the perfective aspect of the matrix clause. Therefore, the speech time will become the default reference time of the relative clause. I leave the technical details an exercise to the reader.

If the above scope theory of the temporal interpretation of perfective relative clauses is correct, in principle the same analysis should also apply to imperfective relative causes. Namely, an indefinite NP containing an imperfective relative clause should be able to be adjoined to VP or IP. This then predicts that sentences such as (47) or (58) would be ambiguous the same way as (60) does. However, as mentioned, these two sentences are not ambiguous. The event time of the imperfective relative clause in these two sentences must be simultaneous with the matrix event time but not with the speech time. Why is the prediction not born out?

Before answering this question, let's examine what the facts are in English. In her book *The Tense System in English Relative Clauses*, Depraetere (1996) points out that there is an asymmetry between definite and indefinite antecedent with respect to the temporal interpretation of relative clauses with present tense. One pair of examples she has provided is the following:

(66) a. You will meet a man who is wearing a blue coat.

b. You will meet the man who is wearing a blue coat.

According to her, out of context, the relative clause in (66b) is much more inclined to get anchored to the speech time than (66a). This contrast seems much similar to the contrast observed for the Chinese data discussed above.

On the other hand, notice that Ogihara (1996) has claimed that sentences like (67) are grammatical.

(67) John met a boy who is crying (in sorrow).

However, Barbara Partee (personal communication) told me that this sentence sounds pretty odd unless with strong contextual support of some kind. For example, if a less introductory verb is used and the relative clause is not merely descriptive but is implying that the state denoted by the relative clause is the result of the matrix clause, then the sentence is OK, especially with help of the temporal adverbial *now* as in (68).

(68) Your son insulted a little girl who is now crying.

Very Similar to Barbara Partee's remark, Carlota S. Smith (personal communication) also pointed out to me that (67) sounds distinctly odd. At the same time, however, she says that a choice of a different verb may change the acceptability. According to her, the following two examples are acceptable, where the relative clause is anchored to the speech time.

(69) a. I spanked a boy who is crying.
b. I hired a boy who is studying Korean.

What we have learned from Ilse Depraetere's, Barbara Partee's and Carlota S. Smith's remarks is that the definiteness of a relativized NP does have an effect on the temporal interpretation of the relative clause, but the effect seems removable given a richer context and an appropriate choice of the matrix verb.

Now what is very interesting is that even for those English sentences that allow a present interpretation of the relative clause, the Chinese equivalents of those sentences are not interpreted the same way. The Chinese equivalents can only get the temporal dependent interpretation where the event time of the relative clause overlaps the event time of the matrix verb. This is shown in (70a) and (70b).

(70) a. Wo da-le yi-wei zai ku de nanhai de pigu
I spank-Asp one-Cl Prog cry Rel boy Rel bottom

'I spanked a boy who was crying (at the spanking time).'
'*I spanked a boy who is crying (at the speech time).'

b. Wo guyong-le yi-wei zai du hanwen de nanhai[18]
I hire-Asp one-Cl Prog study Korean Rel boy
'I hired a boy who was studying Korean (at the hiring time).'
'*I hired a boy who is studying Korean (at the speech time).'

The above two examples strongly indicate that in Chinese the definite vs. indefinite distinction with respect to the temporal interpretation of an imperfective relative clause is a grammatically encoded distinction that cannot be easily overridden by pragmatics.

Returning to the original question, I recast it as follows. If the proposed scope account of the ambiguity of perfective relative clauses is correct, it suggests that some principle blocks an indefinite NP with an imperfective relative clause from being QR-ed to IP. The question is what this principle is and why it holds. I believe that the answer must be sought through the nature of indefinites. So let me first discuss some properties of indefinites.

Since Milsark (1977), it has been well-known that indefinites have weak (non-presuppositional) and strong (presuppositional) readings. The strong reading presupposes existence of the entities that the indefinites are applied to, whereas the weak reading asserts existence of the entities they are applied to. Diesing (1992) proposes a mapping hypothesis to account for such an ambiguity. According to her, indefinites construed as weak must remain within VP, whereas strong indefinites are outside VP (i.e., in [SPEC,IP] or adjoined to IP). Suppose that Diesing's assumption that indefinites adjoined to IP must receive a presuppositional reading is correct. This then predicts that an indefinite NP with an imperfective relative clause is presuppositional when it is adjoined to IP. I suggest that this is exactly what goes wrong for Chinese sentences like (47) or (58) when we try to relate the relative clause to the speech time.

To begin with, let us consider a very interesting set of Chinese data. In Chinese, the common noun in an indefinite may be overtly topicalized, thus establishing a domain of quantification and making the indefinite specific. This is illustrated by (71), where the aspect is perfective as the perfective marker *le* indicates.

[18] This sentence is compatible with a situation where the boy was studying Korean at the hiring time and is still studying it at the speech time. This seemingly double-access-like interpretation is a pragmatic inference. What is excluded is the possibility that the boy is not studying Korean at the hiring time but is studying it at the speech time.

(71) Xiaoshuo wo du-le yi-ben/san-ben (le)
novel I read-Asp one-Cl/three-Cl Asp
'As for novels, I read of one/three of them.'

However, if the aspect is imperfective as in (72), topicalizing the common noun of an indefinite is not allowed.

(72) *Xiaoshuo wo zai du yi-ben/san-ben
novel I Prog read one-Cl/three-Cl
'As for novels, I am reading one/three of them.'

The contrast between (71) and (72) clearly indicates that the descriptive content of an indefinite object in a progressive sentence cannot be topicalized, i.e., adjoined to IP peripheral, making the indefinite presuppositional. In fact, even if no topicalization occurs, an indefinite object in a perfective sentence is also more likely to be presuppositional than an indefinite object in an imperfective clause. For example, it is easy to link the indefinite in (73a) with a pre-established set of novels, but this seems quite difficult for (73b). In (73b), the speaker must assert existence of the referent to which the indefinite is applied to.

(73) a. Wo du-le liang-ben xiaoshuo le
I read-Asp tw-Cl novel Asp
'I read two (of the) novels.'
b. Wo zai du liang-ben xiaoshuo
I Prog read two-Cl novel
'I am reading two novels.'
'*I am reading two of the novels.'

Although I don't know exactly what condition bans the descriptive content of the indefinite in (72) from being adjoined to IP-peripheral, it seems quite plausible to claim that the same condition blocks a relativized indefinite with a progressive relative from being adjoined to IP.

In contrast to indefinites in an imperfective clause, as we saw in (71), the descriptive content of an indefinite in a perfective clause can be easily presupposed. This is parallel to the fact that a relativized NP with a perfective relative can be adjoined to IP.

At this time, it is interesting to note that an indefinite embedded in an intensional verb is ambiguous between a specific and non-specific reading. Thus, (74) can be

understood either as ‘There is a certain policeman such that he is looking for him’ or ‘He is looking for a policeman—whoever he is’.

(74) Ta zai zhao yi-wei jingcha
he Prog look-for one-Cl policeman
‘He is looking for a policeman.’

With this in mind, now let us consider a situation where the indefinite object NP in (74) is further modified by a progressive relative as in (75).

(75) Ta zai zhao yi-wei zheng zai ban an de jingcha
he Prog look one-Cl right Prog investigate case Rel policeman
‘He is looking for a policeman who is investigating a case.’

Interestingly, (75) seems to have only the specific reading, not the nonspecific one.[19] Moreover, the relative clause must be anchored to the speech time. At first glance, this seems to be a counterexample to the proposed scope account of the perfective vs. imperfective distinction, but a second thought might find a way out. The first thing to note about (75) is that the matrix clause also has a present interpretation. Now suppose that the relativized NP is adjoined to VP rather than IP. Then, the matrix event time is the reference time of the relative clause. Therefore, the imperfective relative must overlap the speech time as is desired. In other words, for the relative clause in (75) to get anchored to the speech time, no adjunction to IP is necessary. The anchoring to the speech time can be derived by adjunction to VP via the present interpretation of the matrix event. This explains half of the fact observed for (75). What about the other half? That is, how should the specificity of the relativized indefinite object NP be explained? I claim that specificity of the indefinite is also derived by adjunction to VP. When the indefinite is adjoined to VP, it c-commands the intensional verb. Therefore, it is outside the scope of the intensional verb and should be interpreted specifically relative to the latter. There is simply no need for the indefinite to be QR-ed to IP in order to be specific. I conclude that the interpretation of the relativized indefinite in (75) is completely fully compatible with the claim that a relativized indefinite with an imperfective relative can only be adjoined to VP.

The above conclusion is further supported by the fact that when the matrix clause in (74) is turned into a past interpretation, the relative clause is not able to get anchored to the speech time but must be temporally simultaneous with the matrix

[19] The lack of non-specific reading can be ascribed to the fact that the relative clause needs to get anchored to some reference time, forcing the relativized NP to undergo QR.

event time.

(76) Ta xiawu de shihou zai zhao yi-wei zheng zai
he afternoon DE time Prog look one-Cl right Prog
ban an de jingcha
investigate case Rel policeman
'In the afternoon, he was looking for a policeman who was investigating a case.'

Like (74), the indefinite in (76) has a specific interpretation, but the relative clause embedded in it is not anchored to the speech time.

Before closing this section, it is interesting to note a subject/object asymmetry with respect to temporal (in)dependence. We have seen that an imperfective relative embedded in an indefinite in object position must be temporally dependent upon the event time of the matrix clause. Very interestingly, when an imperfective relative is embedded in an indefinite in subject position, this constraint no longer holds. For example, in contrast to (47) and (58), (77) has a reading on which the relative is anchored to the speech time rather than the matrix event time.

(77) (You) yi-wei zai dengdai miantan de yingzhengzhe shi
have one-Cl Prog wait interview Rel applicant be
wo-de gao-zhong tongxue
my high-school classmate
'An applicant who is waiting to be interviewed was my classmate in high school.'

Why is there a subject/object asymmetry with respect to temporal (in)dependence? I guess that the answer is as follows. Subject is higher than object and is outside the scope of VP and Aspect. Therefore, a relative clause embedded in a subject indefinite can get anchored to the speech time. Moreover, the information status of subject is different from that of object. When an indefinite appears as the object of a verb, it tends to introduce a new referent into the discourse. Thus, the description part associated with the indefinite determiner also tends to be new information that is asserted in the discourse. In contrast to object, subject tends to be more topical and hence easier to represent old information. Indeed, it sounds to me that the indefinite in (77) has a very strong tendency to be interpreted as a partitive NP, where there are more than one applicants who are waiting to be interviewed. In fact, (77) also implies that both the speaker and the hearer know that there are applicants who are now under interview. Possibly it is the topicality of the subject position that makes the

imperfective relative in (77) much easier to become the presupposition of the indefinite.

It is interesting to note that the subject/object asymmetry is not unique in Chinese. Carlota S. Smith (personal communication) has informed me that reduced relatives in English show a similar contrast. Here are some examples provided by her:

(78) a. A boy crying in the corner was spanked by the teacher.
b. The boy crying in the corner was spanked by the teacher.

The reduced relative in both of these sentences seem to have only the interpretation where the crying event is anchored to the speech time. In contrast, the interpretation seems different for non-subjects in (78):

(79) a. Mary married a boy studying Korean. –probably past
b. Mary married the boy studying Korean. –probably present

7. Concluding Remarks

In this paper, I have discussed how the temporal interpretation of Chinese sentences is determined via viewpoint aspect, verbal semantics, temporal adverbials, the definite/indefinite distinction, quantifier raising, informational status of a noun phrase, pragmatics and people's knowledge of the world. An important conclusion that we may learn from the discussion is that there is no need to resort to covert semantic features under an empty tense node in order to interpret time in Chinese. This then questions the need to postulate an empty tense node in the Chinese phrase structure, because such a node will not play a role in semantics. Instead, aspect in Chinese seems to replace the role that tense plays in a tense language, because often aspect alone can determine the temporal interpretation of a clause. This is true not only for simplex sentences but also for complex sentences. If this implication is correct, it raises a very interesting question about what the IP, that a subject noun phrase targets, really is, given that Chinese also has no agreement at all. I do not know the answer at this stage and would like to leave this question to syntacticians, who might have a better answer to it.

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