Decoupling tense and aspect in Chinese
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In languages that lack tense morphemes, how is the meaning of tense manipulated by the grammar? In this paper, we approach this question by focusing on Chinese, a language which famously lacks overt tense morphology. We evaluate Lin's (2006) proposal that aspect markers in the language are bundles of aspect and tense semantics. Our test cases include sequence of "tense" environments in which the aspect markers LE and GUO are found in embedded contexts. We present data, supported by results of an online questionnaire, that argue against analyzing these markers as past-plus-perfective bundles. While GUO resists simultaneous readings in the relevant configurations, LE does not behave as expected of a past-plus-perfective bundle.

The paper is structured as follows. We begin by laying out our theoretical assumptions about the semantics of viewpoint aspect and tense in section 1. In section 2, we describe the aspectual and temporal properties of the Chinese markers GUO and LE and the bundling account that has been proposed in the recent literature to account for their hybrid behavior. Section 3 puts the bundling account to the test. We present new data regarding the behavior of these aspect markers in two sequence of tense environments, which does not lend support to the bundling account. Section 4 discusses the implications of these findings for the semantics of GUO and LE. We summarize our discussion and conclude in section 5.

1. The grammatical representation of tense and aspect

The notions of tense and aspect both revolve around temporal relations between event descriptions and the timeline of events in some world of evaluation. We follow much of the literature since Reichenbach (1947) in assuming that the association between event descriptions and times in a world is not direct, but mediated by a third entity, the *topic time*.[1] Assuming an event semantics for verb phrases (Davidson 1967), the role of (viewpoint) aspect is to relate the *event time* described by the VP to a *topic time*, and the role of tense is to relate the *topic time* to an *evaluation time*. Aspect provides information about the temporal progression of events, while tense provides the anchoring of these events to an evaluation time (either the time of utterance, or a displaced 'now' of an intensional context). Schematically, the meanings of a verb phrase, aspect, and tense are represented as in (1), following Kratzer's (1998) formalization of Klein's (1994) aspect semantics.[2] Note that we depart from Kratzer's analysis by representing tense as an operator, instead of a pronoun.

(1) a. $[[\text{VerbP}]] = \lambda e_e.\lambda w_s.P(e)(w)$
     b. $[[\text{Aspect}]] = \lambda P_{<e,st>}.\lambda i_i.\lambda w_s.\exists e_e.P(e)(w) \ \& \ \tau(e) \circ i$
     c. $[[\text{Tense}]] = \lambda Q_{<i,st>}.\lambda i'_i.\lambda w_s.\exists i_i.Q(i)(w) \ \& \ i \sim i'$

In (1), '$\circ$' stands for a temporal inclusion/overlap relation, '$\sim$' stands for a temporal precedence relation, and 'τ' is the temporal trace function that maps events to the time interval in which they take place. For perfective aspect, '$\circ$' is realized as the subset relation $\subseteq$. For past tense, '$\sim$' is realized by the temporal

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1   Topic time is also characterized by Klein et al. (2000) as the *assertion time*. It corresponds to Reichenbach's *reference time*.

2   We use the following notation for semantic types in this paper: e = event, s = world, i = time (interval), t = truth value, d = individual.

precedence relation <.

Languages differ in the inventory of morphemes (inflectional affixes and auxiliaries) that decorate verbal projections with information about tense and aspect. Some languages grammaticize both tense and aspect, others grammaticize just tense, and yet others grammaticize just aspect. English is a familiar language of the first type. In a sentence like *John was swimming*, *was* contributes information about the temporal location of a swimming event with respect to the time of utterance, while the *-ing* suffix contributes information about the progression of the event.

In languages that grammaticize tense or aspect but not both, the grammatically unspecified information may be obtained in several ways. Bohnemeyer & Swift (2001, 2004) propose that there may be telicity-determined aspectual specification, for example a default aspect for clauses that are not overtly marked for perfective or imperfective aspect. Similarly, Comrie (1976) proposes that there may be aspect-based tense specification.

Mandarin Chinese is usually described as belonging to the third type of languages. It is a morphologically tenseless language with grammaticized aspect markers.

> "Aspect, or aspect marking, has received a great deal of interest in Chinese linguistics in the last thirty years. [..] This interest might be due to the fact that markers of aspect are the only kind of morphology-like devices in the language." (Klein et al. 2000: 723)

The semantics of these aspect markers and their temporal contribution continues to be a topic of debate. We turn next to a basic description of the perfective aspect markers that will be the focus of our discussion.

2. Mandarin Chinese: a morphologically tenseless language

Chinese has no inflectional tense morphology and is usually described as an aspect-only language, belonging to the third class of languages above.[3] The temporal location of events is determined with the help of information gleaned from the discourse context in addition to linguistic devices such as frame-setting adverbs ('last week'),[4] clause-connecting adverbs (*yǐjīng* 'already', *cái* 'just, only then'), and future-oriented verbs and modal verbs (*juédìng* 'decide', *yào* 'want, should, need, will').[5]

Without these devices, the temporal interpretation of a VP without an aspect marker, or a zero-marked VP, is correlated with the telicity of the eventuality described by the VP, instantiating Bohnemeyer & Swift's generalization (2001, 2004). The zero-marked VP in (2a), for example, is atelic and the sentence is interpreted in the present tense. In (2b) the eventuality described by the VP is telic and the sentence is interpreted in the past tense.[6]

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3   Chao (1948: 54, 1968), Li & Thompson (1981), Smith (1997 [1991]), Klein et al. (2000), Smith & Erbaugh (2005: 720-721). The reader is referred to these studies for a more comprehensive list of references to works on the Chinese particles (see in particular Lin (2006: 9) and Smith & Erbaugh (2005: n. 14)). Comrie (1976: section 4.4, p. 128) presents Chinese alongside Arabic as an example of a language with verbal morphology that is a combination of aspect and tense. Lin (2006) can be seen as siding with Comrie in the debate (see below).

4   Di (2007) argues that a subset of temporal expressions in Chinese have nominal status and uses this fact to support the existence of a tense projection in the language.

5   See Smith & Erbaugh (2005: 730-732) for a more complete list and textual examples.

6   Bohnemeyer & Swift's proposal explains the present interpretation of an atelic predicate straight-forwardly, but fails to explain the past interpretation of telic predicates. Lin (2006) thus proposes the following modification: "In order to explain the fact that perfective aspect in Chinese always gives rise to a past interpretation, I propose that the definition of

(2) a. Zhangsan hen   mang.
         Zhangsan very   busy
         'Zhangsan is very busy.'

     b. Zhangsan da-puo   yi-ge   huaping.
         Zhangsan hit-break one-CL vase
         'Zhangsan broke a vase.'

The verb-final aspect markers, LE, GUO, ZHE, and ZAI, also seem to have a temporal contribution. In the case of the perfective markers LE and GUO, a meaning of temporal anteriority seems to be contributed.[7]

(3) a. Lisi   da-puo-guo   yi-ge   beizi.
         Lisi   hit-break-GUO   one-CL   cup
         'Lisi once broke a cup.'

     b. Lisi   da-puo-le   yi-ge   beizi.
         Lisi   hit-break-LE   one-CL   cup
         'Lisi {broke, has broken} a cup.'

With GUO, which is called an *experiential* marker in the traditional literature on Chinese, the event described is understood to have taken place in the past (Chao 1968, Comrie 1976) and to "[have] been experienced at least once at some indefinite time" (Li & Thompson 1981: 226). GUO also contributes a "discontinuity" inference, or a "repeatability" condition, which requires that the event's result state no longer holds at the time the sentence is uttered (Li & Thompson 1981, Iljic 1990, a.o.).

LE, which is referred to as a *perfective* marker, also describes events that have taken place in the past. It indicates completion or termination of the event described (Li & Thompson 1981, Smith 1997), but conveys that the event's result state holds at the time the sentence is uttered. LE contributes an inceptive or inchoative meaning when the eventuality described is stative (Chao 1968, Comrie 1976: 20, Klein et al. 2000: 725, Smith & Erbaugh 2005: n. 15).[8]

Given these informal descriptions, the question has naturally arisen as to whether LE and GUO are pure aspectual morphemes whose temporal contribution is complemented by null tense heads or pragmatic principles, or whether they carry semantic tense, in particular past tense, in their denotations. A recent proposal by Lin (2006) has put forth the claim that LE and GUO are not in fact pure aspect markers, but rather past tense and perfective aspect "packed into one morpheme". Schematically, simplifying differences between individual markers, this amounts to associating them with denotations like the following.

(4) $[[\text{bundled tense-aspect markers}]] = \lambda P_{<e,st>}.\lambda i_i.\lambda i'_i.\lambda w_s.\exists e_e.P(e)(w) \ \& \ \tau(e) \circ i \ \& \ i \sim i'$

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     perfective aspect [...] is revised [...] in Chinese, with a precedence relation between the topic time variable and the evaluation time variable added." (Lin 2006: 6)
7   We restrict our attention to verb-final aspectual particles and thus set aside occurrences of LE at the end of sentences. For a recent discussion of the relation between verb-final LE and sentence-final LE, see Soh & Gao (2006).
8   We found some traces of an inceptive use also with GUO, as we discuss below.

If correct, this *bundling account* implies that there is no TP in Chinese.[9] But does it make correct predictions for embedded tense-aspect bundles? We look at two kinds of such environments below and conclude that the bundling account requires modifications.

3. Testing the bundling account in sequence of tense environments

One testable prediction of a bundling approach to tense and aspect concerns the phenomenon of *sequence of tense (SOT)*. Sequence of tense is the name used in the literature to refer to ambiguities in the interpretation of sentences, like (5), that contain one or more tenses embedded under one another (in the context of certain verbs). The sentence has both a simultaneous and a back-shifted interpretation, as indicated.

(5)   The man realized that the machine swallowed his card.

   i.   *Simultaneous* interpretation: the realization comes at the same time as (what the man believes to be) the time of card-swallowing.
        … the past tense in the embedded clause seems to be ignored.

   ii.   *Back-shifted*[10] interpretation: the realization comes after (what the man believes to be) the time of card-swallowing.
        … both tenses seem to be contributing to the overall meaning of the sentence.

Not every occurrence of past tense in every language gives rise to this ambiguity.[11] But if Chinese aspect particles include past tense shifting as the bundling account supposes, their semantic contribution in embedded contexts should be detectable. In particular, the bundling account predicts that an embedded clause with perfective aspect in Chinese should pattern like a corresponding past tense embedded clause in a non-SOT language.

3.1 Environment 1: Perfective-under-perfective

The bundling account predicts that if perfective aspect (represented by GUO, LE, or the default aspect of telic predicates) is embedded under a verb like 'say', the event time of the embedded clause is necessarily earlier than the 'now' of the attitude holder in the matrix clause.[12] As an illustration, consider the meaning assigned under the bundling account to the Chinese sentence 'She say John strike out-LE'.

(6)   a. $[[\text{John strike out}]] = \lambda e_e.\lambda w_s.\text{strike-out}(e, \text{John})(w)$

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9   Such an account succeeds in accounting for the basic Chinese data without positing a tense projection, although it does not prove that such a projection is absent from the language. Whether Chinese has a covert Infl/T projection or not in the syntax has been a controversial topic. Huang (1998) and Li (1985), for example, argue that Infl exists in Chinese. Hu et al. (2001) contend that the evidence discussed by these authors is not valid. Based on the lack of independent evidence, they conclude that tense (more precisely, the finite/non-finite distinction) does not exist in Chinese.

10 Kusumoto (1999) suggests the more neutral term, *earlier-than-matrix*.

11 See Kusumoto (1999: 82f.) for discussion of English, Dutch, and Spanish as "SOT languages" versus Japanese, Russian, and Polish as "non-SOT languages". For further cross-linguistic studies see Comrie (1986) and Ogihara (1989, 1996).

12 More precisely, the time of the event's inner stage in Lin's (2006) definitions:

   $[[\text{ GUO }]] = \lambda P_{<i,t>} \lambda t_{Top} \lambda t_0 \exists t [P(t) \wedge \text{IStage}(t, P) \subseteq t_{Top} \wedge t_{Top} < t_0]$

   $[[\text{ LE }]] = \lambda P_{<i,t>} \lambda t_{Top} \lambda t_0 \exists t [P(t) \wedge \text{IStage}(t, P) \subseteq t_{Top} \wedge t_{Top} < t_0 \wedge t_{ana} \subseteq \text{Rstate}(t, P)]$

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

b. $[[LE]] = \lambda P_{<e,st>}.\lambda i_i.\lambda i'_i.\lambda w_s.\exists e_e.P(e)(w)$ & $\tau(e) \subseteq i$ & $i < i'$ & result-relevant(e)

c. $[[say]] = \lambda P_{<i,st>}.\lambda x_d.\lambda e_e.\lambda w_s.\forall <w',i'>$ compatible with x's saying event e in w: $P(i')(w')$

d. $[[John\ strike\ out\text{-}LE]] =$
  $\lambda i_i.\lambda i'_i.\lambda w_s.\exists e_e.$strike-out(e, John)(w) & $\tau(e) \subseteq i$ & $i < i'$ & result-relevant(e)

e.   After existential closure of the topic time variable (Lin 2006):
  $[[say\ [John\ strike\ out\text{-}LE]\ ]] =$
  $\lambda x_d.\lambda e_e.\lambda w_s.\forall <w',i'>$ compatible with x's saying event e in w:
  $\exists i.\exists e_e.$strike-out(e, John)(w') & $\tau(e) \subseteq i$ & $i < i'$ & result-relevant(e)

f. $[[\ Mary\ say\ [John\ strike\ out\text{-}LE]\ ]] =$
  $\lambda e_e.\lambda w_s.\forall <w',i'>$ compatible with Mary's saying event e in w:
  $\exists i.\exists e_e.$strike-out(e, John)(w') & $\tau(e) \subseteq i$ & $i < i'$ & result-relevant(e)

According to the bundling account, only a back-shifted interpretation is predicted: John's striking out is contained in an interval, i, which strictly precedes Mary's speaking at i′.

Although this accords with Lin's intuitions, data we have collected show that the prediction of back-shifting is borne out only in the case of an embedded clause with GUO, and that an embedded clause with LE and embedded clause in default perfective aspect allow simultaneous readings. The examples below contain the sentences we tested, along with their contexts, both in an online questionnaire (N = 20) and with our consultants (N = 2). The consultants' judgment and the results of the questionnaire are summarized in section 3.3 below.

Example (7) provides the first indication that embedded clauses with LE allow simultaneous readings under telic matrix VPs. In the context provided, two events of vase breaking are described: one that took place in the past relative to the utterance time and one that is alluded to in the present (relative to that time). In this case, the simultaneous interpretation (7a) is found alongside the back-shifted interpretation (7b). Both are possible interpretations of the sentence, which is minimally different from Lin's by having LE instead of GUO in the embedded clause (cf. his example (46)). We see that the difference between the two markers makes a difference regarding the possible temporal interpretation of the embedded clause.

(7)   **Context:** Mary always enters John's glass shop with a big backpack on her back. Last month she broke a vase this way and she just entered the shop again now. Oh no, …:

Yuēhàn   **shuō**   Mǎlì   **dǎpuò-le**   huāpíng.
John   **say**   Mary   **break-LE**   vase
(cf. *John said that Mary broke a vase*)

a. 'John may be talking about the second vase.'
b. 'John may be talking about the first vase.'

Additional examples of simultaneous readings were found in the bank scenario in (8) and the basketball game scenario in (9). In both cases, simultaneous interpretations of the embedded clause ((8a) and (9a)) were available and even preferred to the back-shifted interpretations of these clauses ((8b) and (9b)).

(8)   **Context:** a man enters the bank shouting.

Tā   **jiàodào** ATM jī   **tūn-diào-le**   tā de xìnyòngkă.
he   **shout**   ATM   machine **swallow-drop-LE** he DE credit card
(cf. *He shouted that the ATM swallowed his credit card*)

a. 'It is possible that the card was taken just now.'
b. 'It is possible that the card was taken a while ago (say last week), but still hasn't been replaced.'

(9)   **Context:** a sport announcer is broadcasting live from a basketball game of a very bad team. They won only one game before in their entire career.

Jiěshuōyuán   **shuō** zhè zhī qiúduì **yíngdé-le** bĭsài.
announcer   **say** this CL   team   **win-LE**   game
(cf. *The announcer said that the team won the game*)

a. 'The announcer is talking about the current game.'
b. 'The announcer is talking about that one game in the past.'

We have seen three examples in which a LE-marked embedded VPs easily gave rise to simultaneous interpretations, contra the predictions of an tense-aspect bundling account of these morphemes. The same prediction of the bundling account regarding the temporal interpretation of zero-marked VPs has proven harder to evaluate, since our informants consistently rejected as ungrammatical variants of sentences (7) through (9) in which there was no aspectual marking in the embedded clause. We return to the question of the interpretation of zero-marked telic VPs in section 3.2, when we discuss a second sequence of tense environment in which they are in fact grammatical.[13]

In sum, these data show that not all perfective markers behave alike in embedded complements. On the one hand, the simultaneous interpretation is available for LE. It is a natural interpretation which, in the right contexts, was offered spontaneously by our consultants. On the other hand, GUO obligatorily back-shifts.[14]

Although suggestive, the data we have seen so far do not immediately refute the bundling account of the Chinese perfective markers. First, the events described by these sentences are not really simultaneous in the exact sense. One might argue that the embedded events (breaking a vase, swallowing an ATM card, winning a game) do in an technical sense occur prior to the matrix event of saying in each example, even under the simultaneous interpretation. Second, and more importantly, the data we have seen so far can be accounted for under an analysis in which the back-shifting component of LE is not a relative, but an absolute tense.

A possible construal of the temporal relations among the matrix event (saying), the embedded event

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13 In the online questionnaire we tested variants that lacked aspectual marking after the verb and found that the simultaneous interpretation was readily available (100% of the respondents allowed it in the variant of example (8), 73.7% allowed it in the variant of example (9)). Crucially, however, these sentences in the questionnaire ended in a sentence final LE and thus cannot be taken as evidence for the interpretation of embedded VPs with absolutely no aspectual marking. The sentence final LE may have facilitated the simultaneous interpretations in these examples.

14 One exception to this pattern was found in a revised version of the basketball scenario of example (9). We discuss this reading below, where we use it to adjudicate between different possible analyses of the data.

(breaking), and the evaluation time in the case of the simultaneous interpretation of sentence (7) is depicted in (10). If LE contained an absolute past tense component, such that the saying and the breaking are merely required to precede the same evaluation time (here, the time of utterance), both the simultaneous and the back-shifted interpretations could be accounted for while keeping Lin's idea that LE is a tense-aspect particle.

(10)
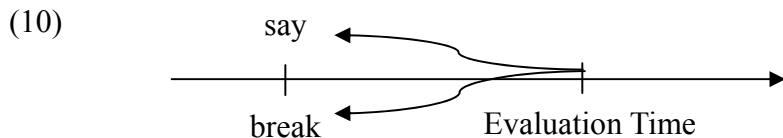
It is useful at this point to recall the arguments put forth in the literature against the absolute/independent tense solution to sequence of tense ambiguities. One of the main arguments against such a solution has been that it cannot account for the meaning contribution of past tense morphology in certain future-shifted contexts.[15] These are therefore the contexts we turn to next. An additional advantage of these contexts is that true simultaneity will be achieved for the embedded event.

3.2 Environment 2: Past morphology in future-shifted contexts

Ogihara (1989, 1996), Abusch (1988, 1997), and others have used examples like the following to argue that there are instances of past tense morphology which do not contribute any meaning of anteriority to a sentence. In (11), the past tense form *were having* describes an event that does not precede the time of utterance, or any other time specified by the adverbials in the sentence. This instance of past tense morphology simply seems to go uninterpreted.

(11)   John PAST decided a week ago that in ten days he PAST would say to his mother that
        they **PAST were** having their last meal together. (Abusch 1988, 1997, Kamp & Rohrer 1984)

(Abusch 1997, (35))
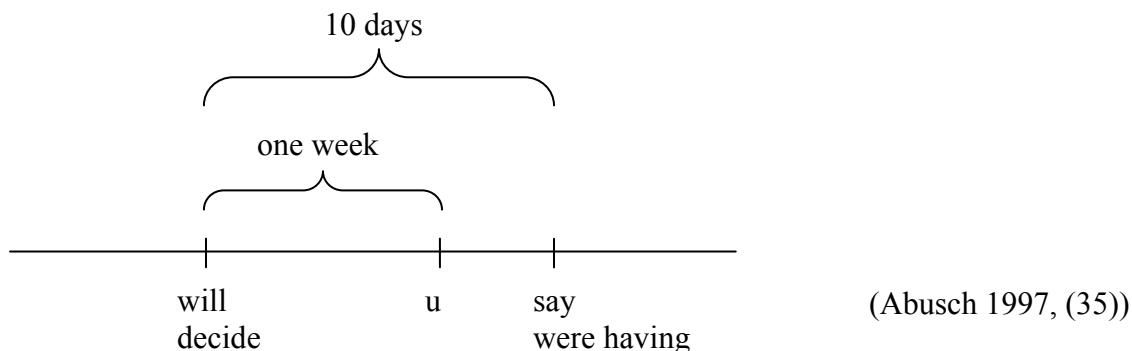
If corresponding Chinese sentences with LE or default perfective aspect are not necessarily back-shifted in the most embedded clause, we have evidence that these aspect markers do not carry the meaning of anteriority proposed in the bundling account.

We tested future-shifted examples in which both the embedding predicate and the embedded predicate were telic and, crucially, there was a natural way to interpret them as describing events that occur

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15 See Kusumoto (1999: 54f.) for a detailed evaluation of such proposals with respect to ruling out later-than-matrix
   interpretations and additional considerations.

simultaneously. In (12), a future wedding ceremony is described in which the breaking of a cup will be broadcast in real time by satellite.

(12)   **Context:** Bill is getting married, but the ceremony is so far away from home that even his mother cannot attend it. Bill thought, at least he could provide a live satellite broadcast of the event. (Bill is Jewish. Breaking a glass is a tradition in Jewish weddings.).

Bĭĕr	zài yī	gè	xīngqī	qián	juédìng	tā	huì	zài yī	gè	yuè	hòu	de
Bill	in one	CL	week	before	decide	he	will	in one	CL	month	after	DE

zhíbō	zhōng	**rang**	tā	māma	**kànjiàn**	tā	**dǎ-suì-le**	bēizi.
broadcast	middle	**let**	his	mother	**see**	he	**beat-break-LE**	cup

a. 'Bill's breaking the cup is during the broadcast'
b. 'Bill's breaking the cup is before the beginning of the broadcast'
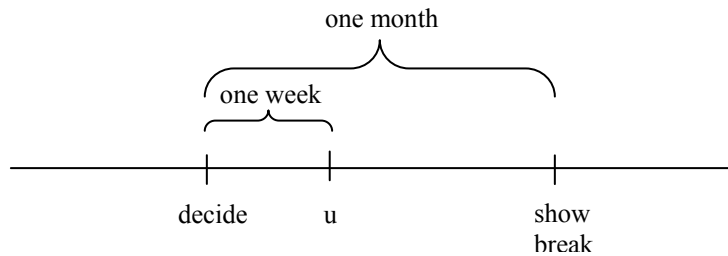
Our consultants as well as a high percentage of respondents to the online questionnaire accepted the simultaneous interpretation of the sentence (12a). That is, they were able to interpret the LE-marked embedded VP as describing an event which happens at the same time as it is broadcast (*rang kanjian* 'let see'), in the future.

For comparison, consider the Japanese sentence in (13). As Japanese is a non-SOT language, the past tense morphology on the embedded verb 'break' cannot go uninterpreted. Therefore, this Japanese sentence can only describe a scenario like (12) if it is the case that the breaking of the cup took place before the broadcast. The broadcast itself, for example, included a screening of a video from a past breaking. Only with present tense morphology on 'break' can Japanese express the simultaneous interpretation of the Chinese sentence.

(13)
issyuukan	mae	ni	Bill	wa	ikkagetu	go	ni	eiseihoosoo	de	kare	no
1.week	before	LOC	Bill	TOP	1.month	after	LOC	satellite.broadcast	by	he	GEN

hahaoya	ni	kare	ga	koppu	o	**wat-ta**	no	o	**mi-se-ru**
mother	DAT	he	NOM	cup	ACC	**break-PAST**	NMLZ	ACC	**see-let-PRES**

koto	ni	kime-ta.
NMLZ	DAT	decide-PAST

The comparison of the Chinese sentence with LE and the corresponding sentence with past tense in Japanese (13) suggests that LE does not include a meaning component of anteriority.

Next, consider an example in which no aspect marker is used on the most embedded VP. Here, a telic

VP ('refuse the mayor's offer') is embedded under a verb of speech ('announce').

(14) **Context:** In one city, the mayor and the city council are not on good terms. The mayor recently offered a big contract to a certain company, without securing the consent of the council. Having found that out, the council summoned the company's CEO to their next assembly. Unbeknown to him, during that meeting he will be required to either reject the mayor's offer or accept it.

Jīntiān	yī	gè	shì	yì	yuán	cāicè	xià cì	shì	yìhuì	shàng
Today	one	CL	city	council	man	guess	next time	city	council	during

gōngsī	zǒngcái	huì	**xuānbù**	tā	**jùjué**	shìzhǎng	de	tían.
company	president	will	**announce**	he	**refuse**	mayor	DE	proposal

'One councilman guessed today that during the next city council meeting the CEO would announce that he rejected the mayor's proposal'

a. 'The CEO's rejection may be given during the meeting'
b. 'The CEO's rejection may be given before the meeting'
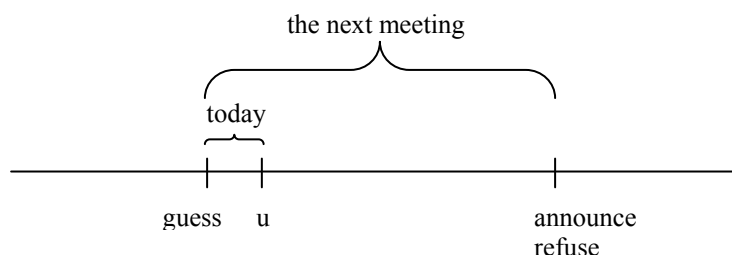
The simultaneous interpretation, in which the content of the CEO's announcement was also the first time the mayor's offer was rejected, is the only possible interpretation of the sentence.[16] Again, a comparison to a corresponding sentence in a non-SOT language is useful. If the zero-marked telic VP in Chinese included temporal shifting to the past, it would have a meaning like that of the Hebrew sentence (15).

(15)
iS	moaca	exad	nibe	ha-yom	Se-bi-ySivat	ha-moaca	ha-baa
man	council	one	forsee-PAST	this-day	that-in-meeting	the-council	the-next

mankal	ha-xevra	**yodia**	Se-hu	**daxa**	et	hacaat	roS	ha-ir.
CEO	the-company	**announce-FUT**	that-he	**reject-PAST**	ACC	offer	head	the-city

When an overt aspect marker was added after the most embedded verb ('refuse' in this case), the sentence was no longer capable of describing the simultaneous interpretation (14a). In the case of GUO, this is not surprising. In the case of LE, it is. The modified sentence with LE ('… announced that he refuse-LE …') only has the back-shifted interpretation in (14b).

To summarize the results of our investigation of future-shifted contexts:

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16 In the online survey, 94.7% of the respondents chose (14a) as a possible interpretation for the sentence in this context. However, 21.1%, or 4 out of 19, also indicated that (14b) was a possible interpretation. Our consultants very clearly rejected this reading.

- Simultaneous reading of a zero-marked perfective aspect (via a telic predicate) is possible.
- Simultaneous reading with LE is possible in the right context as well.
- LE and default aspect markers in Chinese seem not to carry the meaning of anteriority associated with past tense.
- Complements of speech act verbs ('announce'-'decline') were rejected even with LE when expressing the simultaneous interpretation.

3.3. Summary of the data

Tables 1 and 2 provide a summary of the data collected in the two sequence of tense environments in Chinese. The data constitutes of judgments of native speaker informants as well as responses to an online questionnaire.

		GUO	LE	∅
Telic-under-telic		Back-shifted, (Inceptive)	Back-shifted, Simultaneous	*
Future-shifted				
	Achievement	Back-shifted	Back-shifted, Simultaneous	Simultaneous
	Speech act	Back-shifted	Back-shifted ('already')	Simultaneous

Table 1: Consultants' judgments.

The simultaneous reading was found to be readily available in sentences with embedded perfective aspect in Chinese, both for zero-marked and a LE-marked telic verb phrases. This result was replicated in the online survey.

		Simultaneous	Back-shifted
Telic-under-telic (example (say-break vase-LE))		75% (15/20)	75% (15/20)
Future-shifted			
	Achievement (example (show-break-LE))	95% (19/20)	10% (2/20)
	Speech act (example (announce-refuse))	94.7% (18/19)	21.1% (4/19)

Table 2: Responses collected through an online questionnaire with 20 participants. Numbers shown are the percentage of respondents that found a paraphrase of the targeted reading appropriate in the context provided. Respondents were instructed to choose all the appropriate paraphrases of the sentence.

The availability of the back-shifted reading can be seen to have varied from context to context (rightmost column in Table 2). We believe that respondents of the questionnaire chose this reading less frequently in the future-shifted examples because the contexts given were easier to construe as describing simultaneous actions. The test contexts were specifically designed to allow also *both* simultaneous and back-shifted interpretations, but the latter required adding assumptions about the scenario. In our fieldwork sessions, the targeted back-shifted readings were clearly available once these additional assumptions were entertained.

4. Implications of the SOT findings for an analysis of Chinese aspect markers

Our findings about the availability of an ambiguity in sequence of tense environments with certain aspect markers in Chinese challenge the tense-aspect bundling account of these markers. While GUO behaves as expected of a past-perfective bundle, LE and zero-marked perfective aspect do not. In this section, we explore two possible reactions to these finding. First, we apply a syntactic account of temporal licensing to Chinese. As an alternative, we explore a semantic analysis which makes the markers more similar to a Perfect than to Past tense. For simplicity, we will focus only on the overt markers GUO and LE in our analysis.

4.1. A syntactic analysis of [+past] licensing

The availability of sequence of tense ambiguities with some Chinese aspect markers requires a system that can account for complicated interactions between tense and aspect. In particular, LE behaves less like a past-perfective bundle and more like the English past tense in the environments we looked at. This opens the way to an analysis of tense ambiguities in Chinese along the lines suggested for English by Kusumoto (2005). Kusumoto's analysis of sequence of tense is the most recent proposal in a line of research that admits that past tense may manifest itself in more than one way in certain languages. Previously, Ogihara (1989) argued for an LF deletion rule that targets past tenses that are c-commanded by other past tenses, optionally removing them from the semantic representation. Stowell (1993) proposed that while all overt past tense morphology is semantically vacuous, every piece of such morphology must be licensed by an unpronounced operator. The null operator is the one that carries the meaning of anteriority. Kusumoto (2005) follows Stowell's proposal. Under her account, sequence of tense is explained by the following assumptions:

- Past tense morphology is like a negative polarity item.
- Every occurrence of *-ed* is interpreted as a time variable $past_i$.
- Each $past_i$ needs to be c-commanded by a phonetically null PAST operator.

Multiple time variables can be bound by a single c-commanding PAST operator. The simultaneous readings are the result of the embedded past tense being bound non-locally by the matrix past operator. Applying this idea to Chinese, we entertain the system in (16).

(16)   (i) GUO and LE do not themselves shift times of evaluation.
        (ii) They introduce a feature ([+past]) that needs to be licensed by a c-commanding past tense operator.
        (iii) Different aspect markers come with different licensing conditions:
        - GUO needs to be immediately embedded under past tense.
        - LE tolerates licensing from a distance.

In matrix contexts, this creates the illusion that aspect is bundled with tense. Otherwise, an embedded LE-marked phrase may receive a simultaneous reading if it is not clausemate with its past tense licensor. The structures for the two interpretations of the sentence 'John say Mary break-LE a vase' (example (7) above), are shown in (17). If each [+past] feature is locally c-commanded by a past tense operator, as in (17a), the back-shifted interpretation is derived. On the other hand, if both features are licensed by only one past tense operator, as in (17b), the one at the matrix level, the result is a simultaneous interpretation of the sentence.

(17)   a. Back-shifted interpretation   b. Simultaneous interpretation
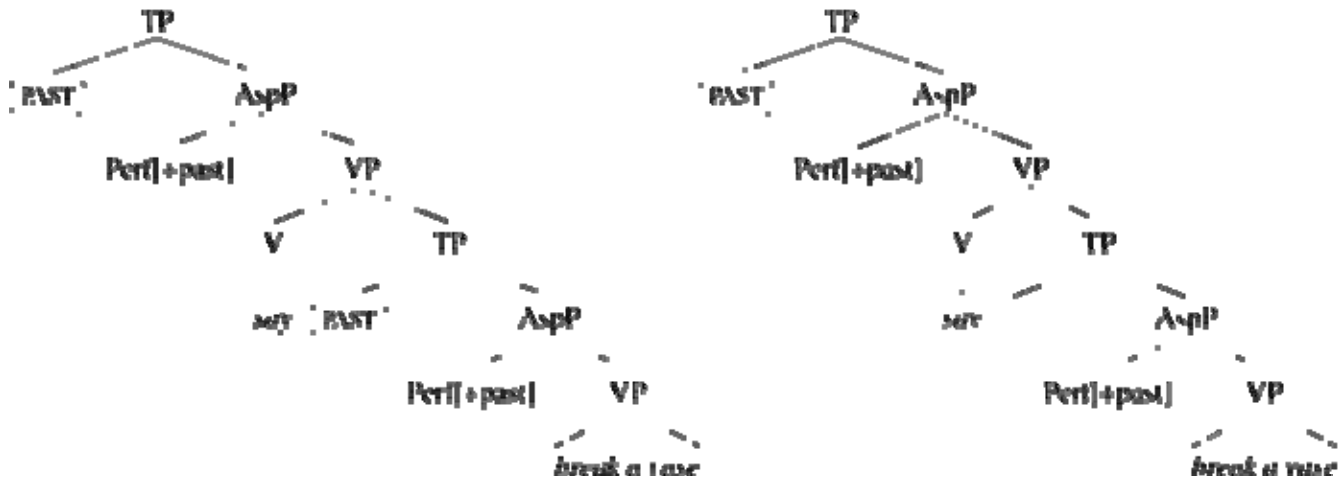
Although GUO seems to be always bundled with past tense, we maintain a single semantic type for aspect markers by separating aspect and tense in GUO's denotation too.

4.2. A semantic analysis based on the Existential perfect

A semantic explanation of the contrasts between the aspectual marks is worth pursuing as well. This is the route taken by many authors before Lin, those that claimed Chinese to be a tenseless language and meant by this that the language lacks independent tense operators and has aspectual morphemes that are purely aspectual. Such an approach aims to derive the temporal interpretations of sentences with LE and GUO by relying on purely aspectual differences between them. A particularly promising idea is that LE and GUO include an aspectual component that corresponds to the Perfect: LE expressing a Resultative perfect and GUO expressing an Experiential perfect (Comrie 1976).[17]

In English, these two perfect interpretations are expressed by one and the same perfect auxiliary and are distinguished only in their interpretation. The Experiential perfect asserts that there is (at least) one eventuality in the interval whose right boundary is the evaluation time (as in *John has visited Paris before*). The Resultative perfect asserts that there is an eventuality in the interval whose right boundary is the evaluation time, and moreover, the result state of the eventuality holds at the evaluation time (as in *John has (just) lost his watch*). Following McCawley (1981), the term Existential perfect is used to cover these two types of uses.

As we will see shortly, there is evidence that LE gives rise to an Experiential interpretation when the VP predicate does not lexically determine a result state, so the semantic analysis we will entertain here

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17 We thank Gillian Ramchand for calling our attention to this.

is one in which GUO is an Experiential perfect and LE is a general purpose Existential perfect, which is able to accommodate both Experiential and Resultative interpretations.

Based on Mittwoch's (2008) analysis of the English perfect, we assume the denotation in (18a) for the Existential perfect. We propose that the meaning of LE is represented by a combination of (18a) and (18b). XN means the "Extended Now", and a target states are a result states which are determined by the lexical meaning of predicates (Parsons 1990). Crucially, this meaning allows the simultaneous interpretation of LE in the environments discussed in section 3, since the event is not required to strictly precede the evaluation time.

(18)   a. $[[\text{Existential}]] = \lambda P.\lambda t.XN(t_c, t) \;\&\; \exists e\, [P(e)\;\&\;\tau(e) \subseteq t_c]$
                where $XN(t', t)$ iff t is the final point of t'

        b.   Non-truth conditional addendum:
                if e denotes a telic transition and has a target state then it is conventionally implicated that the target state of e holds at t.

        (after Mittwoch 2008)

Clearly, GUO cannot be associated with this denotation, as it was shown to be obligatorily back-shifting in the same contexts. There are (at least) two ways to account for this fact: to introduce anteriority into the condition on its Extended Now, or to change the non-truth conditional addendum in a way that will ensure that the event happens before the evaluation time. These are sketched in (19a) and (19b), respectively.

(19)   a. $XN_{GUO}(t', t)$ iff $t' < t$

        b.   Non-truth conditional addendum (GUO):
                if e denotes a telic transition and has a target state, then it is conventionally implicated that the target state of e does not hold at t.

Both amendments can deliver an obligatorily back-shifting GUO. We believe, however, that it is possible to adjudicate between the two based on a further, special, use of GUO that we turn to next.

A special use of GUO
Under certain circumstances, it is possible to use GUO to describe events that takes place at the evaluation time, not before it. This simultaneous-like interpretation was found in the sports broadcasting context in (9), reproduced below for convenience.

(9)   **Context:** a sport announcer is broadcasting live from a basketball game of a very bad team. They won only one game before in their entire career.

Jiěshuōyuán	**shuō**	zhè	zhī	qiúduì	**yíngdé-le**	bǐsài.
announcer	**say**	this	CL	team	**win-LE**	game

    a. 'The announcer is talking about the current game.'
    b. 'The announcer is talking about that one game in the past.'

According to our consultants, reading (9a) is possible if the predicate *yíngdé* 'win' is accompanied with LE, but impossible if the predicate is accompanied with GUO (GUO forces reading (9b)). However, if we imagine a slightly different situation, in which the very bad team had not won any game since its formation, interestingly, the sentence with GUO can in fact be used. Using GUO emphasizes that the team is now, for the first time in its history, in the state of having experienced victory.

How should this use be accounted for? If we suppose that the Extended Now in the lexical entry for GUO does not contain the evaluation time, then it is difficult to explain why GUO can be used in this special way. The syntactic approach entertained in section 4.1 suffers from the same difficulty. On the other hand, if we suppose that the Extended Now in the lexical entry for GUO is the same as that for LE, then in principle GUO can be used in the situation under discussion. Specifically, suppose that GUO has the non-truth conditional addendum given in (19b). The predicate in (9), if understood as "winning of **a** game", does not have a target state,[18] so the condition in the addendum is vacuously satisfied. Furthermore, by using GUO and not LE the speaker may be emphasizing that the time period before the current event (i.e., t_c) was especially long.

GUO and LE as perfects
The semantic account of the aspect markers as perfects is supported not only by the behavior of LE and GUO in sequence of tense environments, but by their distinguishing properties noted at the outset in section 2. First, the analysis of GUO as an Experiential marker accords with the condition that the eventuality it describes be "repeatable" (Li & Thompson 1981, Iljic 1990, Pan & Lee 2004, Lin 2006, 2007, and others).[19] Whereas (20a) implies that Lisi's leg is now healed, (20b) implies that his leg is still broken.

(20) a. Lisi shuai-duan-guo tui.
          Lisi fall-break-GUO leg
          'Lisi has broken his leg before.'

      b. Lisi shuai-duan-le tui.
          Lisi fall-break-LE leg
          'Lisi has broken his leg.'

      (Lin 2007: 238 ex. 1)

Similar claims about repeatability have been made with respect to the English Experiential perfect.[20]

Second, although LE is able to convey a resultative inference for certain VPs, it is also compatible with

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18 On the other hand, "winning of **the** game" has a target state. A relevant argument about the repeatability condition can be found in Lin (2006).
19 Actually, this condition is a bit too strong, as noted by Chen (1979), Iljic (1990), Pan and Lee (2004), and Lin (2007) and others. For example, predicates *nianqing* 'young' and *lao* 'old' are both non-repeatable, but *nianqing* can in fact be used with GUO:
(i)   a. Ni ye niangqing-guo.
           you also young-GUO
           'You also have been young before.'
       b. * Niye lao-guo.
            you also old-GUO
            'You have also been old before.'   (Lin 2007: 239 ex. 3)
20 See e.g., Inoue (1978), McCawley (1971), Dahl (1985). Mittwoch (2008) suggests that the condition may be not a necessary condition.

predicates that do not carry such an inference. Thus, LE can be used in Chinese in questions like 'Have you seen my slippers?' to inquire (as in English) about an event that does not have current relevance. We conclude that LE is better treated as an Existential perfect than just a Resultative.

5. Conclusion

In this paper, we presented evidence against a bundling account of perfective aspect and past tense for the Chinese aspect markers LE and GUO. Our data, collected in consultations session and through an online questionnaire, points to the fact that although LE and GUO often convey anteriority of the events they describe, they do not themselves locate topic times before evaluation times in their lexical entries. We entertained a syntactic analysis of feature licensing and a semantic analysis based on the perfect in order to account for these findings.

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