Abstract

This paper argues that the process-related durative phrase in Chinese should be analyzed as the numeral classifier phrase, and the syntax-semantics mismatch that is involved in this construction can be resolved by a scope parallelism that makes reference to the syntactic parallelism between the verbal and the nominal domains. The scope parallelism principle is dubbed the “Archimedes’ Principle” in linguistics. It is argued that the principle can also shed light on other instances of syntax-semantics mismatches in English.

Keywords: CP-DP parallelism, durative phrases, numeral-classifier phrases, syntax-semantics mismatch
1. Introduction

This paper investigates different types of durative phrases in Mandarin Chinese and the theory of syntax-semantics mapping. Following Li (1987), I propose that the process-related (P-related) durative phrase that appears in the post-verbal position, as in (1), should be analyzed as the numeral-classifier phrase, rather than as a floating adverb left by verb-raising; cf. Huang (1997), Lin (2008, 2011), Tang (1994):

(1) Zhangsan mai-le san nian (de) yu.
    Zhangsan sell-Asp three year DE fish.
    “Zhangsan sells fish for three years.”

The syntactic analysis that treats this type of durative phrase as a numeral-classifier phrase, however, leads to a problem of syntax-semantics mismatch, as noted in Huang (1997), since the durative phrase (as the numeral-classifier phrase) in the nominal domain actually measures the verbal domain—that is, it measures the length of the event, rather than the NP. I argue that the mismatch is only apparent, and it reflects a deeper categorial parallelism in syntax (Abney 1987; Grimshaw 2000; Hiraiwa 2005; Larson and Cho 2003; Liao 2011; Megerdoomian 2008; Ogawa 2001; Riemsdijk 1998; Stowell 1981; Svenonius 2004; Vergnaud 2013; and others). The parallelism may also account for other related syntax-semantics mismatches, where a syntactic nominal element takes an LF scope in the verbal domain. I thus propose the “Archimedes’ Principle” for the proportional scope translation between the nominal domain and the verbal domain, as in (2):

---

1 The term “Archimedes’ Principle” in linguistics was first coined by Jean-Roger Vergnaud (2013), in which he tries to capture the structural parallelism between verbal and nominal projections in the underlying syntactic architecture.
(2) The “Archimedes’ Principle” in UG

A nominal element may take a parallel scope position in the corresponding verbal domain at LF.

The principle is rooted in the verbal-nominal categorial parallelism that has been proposed in the generative grammar, as in (3) (see Abney 1987; Grimshaw 2000; Hiraiwa 2005; Larson and Cho 2003; Liao 2011; Megerdoomian 2008; Ogawa 2001; Riemsdijk 1998; Stowell 1981; Svenonius 2004; Vergnaud 2013; and others):

(3) Parallel Verbal-Nominal Domains

<table>
<thead>
<tr>
<th>Verbal domain</th>
<th>Nominal Domain</th>
</tr>
</thead>
<tbody>
<tr>
<td>$C_{[F3]}$</td>
<td>$Q_{[F3]}$</td>
</tr>
<tr>
<td>$T_{[F2]}$</td>
<td>$D_{[F2]}$</td>
</tr>
<tr>
<td>$A_s_p_{[F1]}$</td>
<td>$CL_{[F1]}$</td>
</tr>
<tr>
<td>$V_{[F0]}$</td>
<td>$N_{[F0]}$</td>
</tr>
</tbody>
</table>

The basic idea is that when a nominal element takes a verbal scope at LF, it is restricted to the level of the corresponding height. That is to say, an NP modifier may only modify VP at LF, but not the higher AspP, TP, or CP. This allows us to account for a mismatch case like John drank a slow cup of coffee, where the NP modifier slow actually modifies the verb drink at LF (the cup is not slow, but the drinking is slow). I shall discuss other cases involving the same type of mismatch in English and in Chinese and show that the mismatch is indeed regulated by the parallelism in (3). The principle therefore provides a restrictive account for the potential LF scope of a nominal element in the verbal domain.
The paper is organized as follows. Section 2 provides a brief introduction of the syntactic issues regarding different types of durative phrases in Chinese. Section 3 discusses the syntax-semantics mismatch involving the P-related durative phrase in Chinese and reviews earlier proposals concerning this problem. I argue that the numeral-classifier analysis may provide a unified account. Section 4 looks at other cases of syntax-semantics mismatches in English and argues that these intriguing problems are governed by the Archimedes’ Principle of the CP-DP parallelism in syntax. Section 5 concludes the paper.

2. Durative Phrases in Chinese

Chinese does not generally allow adverbs in post-verbal positions, so the syntax of the post-verbal durative phrase, as in (4), has been a controversial topic:

(4)  

Zhangsan  shui-le  san  xiaoshi.

Zhangsan  sleep-Asp  three  hour

“Zhangsan slept(has been sleeping) for three hours.”

In the generative literature, three types of analyses can be found of the post-verbal durative phrases (DurP): (i) the complement analysis (Huang 1982; Li 1987), (ii) the sentential subject analysis (Li 1987; Shi 2006), and (iii) the floating-adverb analysis (Huang 1997; Lin 2008, 2011; Tang 1994). The first type of analysis (the complement analysis) assumes that the post-verbal durative phrase is a direct complement of the main verb, as in (5):

(5)  

\[ VP  V [\text{Complement} \text{DurP}] \]
The second type of analysis (the sentential subject analysis) argues that the post-verbal
durative phrase is actually a syntactic predicate that takes a sentential subject, as in (6):

(6)  [IP1 [IP2 Sentential Subject] [Predicate DurP]]

The third type of analysis (the floating-adverb analysis) assumes that the post-verbal durative
phrase is originally adjoined to VP or Aspectual Phrase (AspP), and it is stranded in the
post-verbal position by head movement of V (FP represents some functional category that the
verb eventually moves into, the specific content of F varies with theory).\(^2\) This is shown in
(7):

(7)  [FP V+Asp+F_i  [AspP (DurP_i) t_i  [VP t_i]]]

In this section, I claim that all the structures can be found in Chinese durative phrases, but
each of them corresponds to a different reading of durative phrase. I then focus on a problem
imposed by the complement analysis, which leads to a syntax-semantics mismatch.

2.1. Three Types of Durative Phrases in Chinese

The durative phrase in English is introduced by the preposition *for* (for atelic predicates), as
in (8):

(8)  John read books *for three hours.*

\(^2\) Some common abbreviations used in this paper are as follows: Asp = aspect, CL = classifier, Num = numeral,
SFP = sentence-final particle, and TS = tone sandhi. Others are explained in the text.
On the other hand, the durative phrase in Chinese does not always need a preposition, and it may occur post-verbally in a bare form (Huang 1982; Li 1987; Liao 2004; Lin 2008, 2011; Shi 2006; Tang 1994; and others), as in (9):

(9) a. *Zhangsan du-le san xiaoshi (de) shu.*
    Zhangsan read-Asp three hour DE book

    (i) “Zhangsan read books/studied for three hours.”

    (ii) *“Zhangsan read the book in three hours.”

b. *Zhangsan nian-le wu nian gaozhong, hai-mei biye.*
   Zhangsan study-Asp five year high.school yet-not graduate

   “Zhangsan attended high school for five years and has not graduated yet.”

Durative phrases are also subject to other restrictions. First, with respect to different types of temporal durations being measured by durative phrases, we can further identify three types of durative phrases in Chinese (for discussion, see Liao 2004). The first type of durative phrase, which is called the “result-related” durative phrase, measures the temporal duration of the “result” directly caused by the event—that is, the time of “being in the water” in (10a). The second type of durative phrase, called the “process-related” durative phrase, measures the process of the event, or the viewpoint time (Smith 1991), hence the time of “attending high school” in (10b). The third type of durative phrase, called the “result time-related” durative phrase, measures the salient part of the event to the reference time (Klein 1994), as in (10c), where the time being measured is the time from graduation to the reference time, which in this case is equivalent to the speech time “now”: 
a. **Result-related (R-related):** measures the result directly caused by the event

\[
\text{Zhangsan tiao dao-shui-li wu fenzhong}
\]

Zhangsan jump to-water-inside five minute

“Zhangsan jumped into the water (and stayed in the water) for five minutes.”

b. **Process-related (P-related):** measures the event (Situation Time) itself

\[
\text{Zhangsan nian-le wu nian gaozhong}
\]

Zhangsan study-Asp five year high.school

“Zhangsan attended high school for five years.”

c. **Resultant Time-related (RT-related):** measures Situation Time to Reference Time.

\[
\text{Zhangsan nian-wan gaozhong wu-nian le}
\]

Zhangsan study-finish high.school five-year SFP

“It has been five years since Zhangsan graduated from high school.”

In this paper, I focus on the syntax of the P-related durative phrase. I propose that the P-related durative phrase be analyzed as a numeral-classifier phrase (and thus as part of the complement DP of the verb), and it is in sharp contrast to the RT-related durative phrase, (which is a predicate taking a sentential subject) and to the R-related durative phrase (which is a floating adverb stranded by predicate raising).

Let us begin by the contrast between the R-related durative phrase and the P-related durative phrase. Adopting Ramchand (2008), Lin (2008) proposes that the R-related durative phrase actually modifies a syntactic result phrase (RP), which is a complement phrase of the main predicate. According to the analysis, (10a) has the underlying structure in (11), and the durative phrase is a modifier of RP:
(11) Zhangsan \( \text{tiao} \) [\text{RP} \ \text{wu} \ \text{fenzhong} \ [\text{R} \ \text{dao-shui-li}]] \\
Zhangsan \overset{\text{jump}}{\longrightarrow} \text{five minute} \ \text{to-water-inside}

The surface word order is derived after the complex predicate RP \([\text{dao-shui-li}]\) raises and incorporates to the main verb \text{tiao} (Huang 1988), hence stranding the durative phrase in the post-verbal position. Independent evidence that this type of durative phrase is a modifier of a result phrase comes from the fact that the R-related durative phrase is not admissible to the verb-copying construction (Huang 1984; Li 1990), which suggests that the R-related durative phrase is not the direct complement of the verb. See (12):

(12) *Zhangsan \text{tiao} \ \text{dao-shui-li} \ \text{tiao} \ \text{wu} \ \text{fenzhong} \\
Zhangsan \text{jump} \ \text{to-water-inside} \ \text{jump} \ \text{five minute}

The ungrammaticality is in sharp contrast to the P-related durative phrase, which can be transformed to the verb-copying construction, as in (13):

(13) a. \text{Lisi} \ \text{nian gaozhong} \ \text{nian} \ \text{wu} \ \text{nian}.
Lisi \text{study high.school} \ \text{study} \ \text{five year}

“Lisi went to high school for five years.”

b. \text{Lisi} \ \text{chi} \ \text{hanbao} \ \text{chi-le} \ \text{shi} \ \text{fenzhong}
Lisi \text{eat} \ \text{hamburger eat-Asp} \ \text{ten minute}

“Lisi ate a hamburger(s) for ten minutes.”
These examples also show that the P-related durative phrase should be treated as a direct complement of the verb. This is because the direct complement of the verb, but not modifiers or adjuncts, is the only element that is admissible to the verb-copying construction (Huang 1982; Li 1987, 1990; Liao 2014).

Shifting our attention to the contrast between the RT-related durative phrase and the P-related ones, I slightly modify Li’s (1987) analysis, and propose that the RT-related durative phrase is a complement of a (silent) predicate you “have,” and it takes the preceding clause as a sentential subject, as shown in (14) (see also Li 1987; Liao 2004; Shi 2006):

\[(14) \quad \text{[IP Lisi nian-wan gaozhong] [PredP (you) wu nian le]}\].

Lisi study-finish high.school have five year SFP

“It has been five years since Lisi graduated from high school.”

Evidence for such an analysis comes from the scope test. Suppose the RT-related durative phrase in (14) were a direct complement to the matrix verb nian “study,” we predict that it should fall under the scope of negation. However, as seen in (15a), the scope of negation can never reach the RT-related durative phrase. Again, this is in sharp contrast to the P-related durative phrase in (15b):
In (15a), the negation has a scope only on the verb phrase “study high school,” and the reading is that Lisi has been a high school dropout for five years, whereas in (15b), the negation has a scope over the whole chunk “study school for five years,” and the most natural reading is that Lisi finished high school in less (or more) than five years.

2.2. A Dilemma of P-Related Durative Phrases

We see that the sentential subject analysis can account for the syntax of RT-related durative phrase, and the floating adverbial analysis better describes the syntax of R-related durative phrase. These analyses also offer transparent syntax-semantics mappings. The RT-related interpretation hinges upon the SFP le (which introduces a reference time that gives rise to the temporal measurement; see the details in Liao 2004), and the result-related interpretation comes from a syntactic RP that provides a measurable “result time” (see Lin 2008). This,

---

3 Another possible reading is that Lisi has never attended high school, but he should have five years ago. Therefore, it has been five years since Lisi chose not to attend high school. In this reading, [five year] still has a scope over the negation.
however, leaves us a dilemma of P-related durative phrases. On the one hand, from the perspective of transparent syntax-semantics mapping, it is very tempting to assume that the P-related durative phrase adjoins to VP or AspP, and it is able to measure the temporal duration provided by the viewpoint aspects in Chinese (Smith 1991; Tenny 2000). This type of analysis, argued in Liao (2004) for Chinese (for a similar analysis of the durative phrase in English, see Demirdache and Uribe-Etxebarria 2004), has an advantage in constructing a straightforward syntax-semantic mapping theory. However, as we see above, syntactic evidence from the scope test and the verb copying construction points out that the P-related durative phrase is best analyzed as the complement of the verb (Li 1987, 1990; Liao 2014).

One might wonder whether the P-related durative phrase can also be analyzed as a floating adverb, on a par with the R-related durative phrase. Unfortunately, the unification is not empirically supported. First, consider other VP-level adverbs, such as manner adverbs (Ernst 2002; Jackendoff 1990). These adverbs are typically local to the main VP, and if we treat P-related durative phrases as floating adverbs (which can be an adverb of VP or AspP), an immediate question that arises is why the manner adverb is not stranded on a par with the P-related durative phrase. Observe the examples in (16). The question is why the order in (16b) can never be derived when *manman-de is a VP-level adverb:

\[(2)\]
\[\begin{align*}
a. & \text{Zhangsan } manman-de & \text{ chi-le } & \text{ shi fenzhong } & \text{ hanbao.} \\
& \text{Zhangsan slow-ly} & \text{ eat-Asp} & \text{ ten minute} & \text{ hamburger} \\
& \text{“Zhangsan consumed the hamburger slowly for ten minutes.”}
\end{align*}\]
\[\begin{align*}
b. & *\text{Zhangsan } [\text{chi-le } [\text{AspP shi fenzhong t_{chi} [\text{VP manman-de } [\text{VP t_{chi} hanbao}]]]}]. \\
& \text{Zhangsan eat-Asp} & \text{ ten minute} & \text{ slow-ly} & \text{ hamburger} \\
& \text{ ten minute} & \text{ slow-ly} & \text{ hamburger}
\end{align*}\]
An anonymous reviewer suggests that manner adverbs in Chinese may appear in higher positions than those in English (Ernst 2010), and it may modify vP, as in the *ba* construction:

(17) *Zhangsan manman-de ba mian chi-le.*

Zhangsan slowly BA noodles eat-Asp

“Zhangsan ate the noodles slowly.”

If the manner adverb appears in a higher position, and the DurP is a VP-level modifier, it may account for why it is not stranded in the post-verbal position after verb raising. The verb raises to v, resulting in the word order: Manner.Adv > V-v > DurP > t_v. However, it should be noticed that the manner adverb may also appear in the local VP domain, as in (18):

(18) *Zhangsan ba mian manman-de chi-le.*

Zhangsan BA noodles slowly eat-Asp

“Zhangsan ate the noodles slowly.”

Therefore, the crucial question is why the VP-level manner adverb could not be found stranded in the post-verbal position. A complement analysis of the durative phrase, on the other hand, is immune to such a problem.

The manner adverb *slowly* always appears adjacent to V and is structurally lower than the other types of adverbs. Such fact again challenges the floating-adverb analysis. If the P-related durative phrase is stranded in the post-verbal position by verb raising, then why are other structurally lower adverbs not stranded in a similar fashion?
In fact, there is evidence that the post-verbal durative phrase is not only a complement of the verb, but it should be analyzed on a par with the numeral-classifier phrase (Li 1987; Liao 2014).4 One strong piece of evidence comes from the two types of de’s in the adjective phrase and in the numeral-classifier phrase. As observed in Tang (2005) and Li (2013), the numeral-classifier de cannot appear at all after NP-fronting, as in (19a), but the adjectival de is obligatory after NP-fronting, as in (19b). The contrast is sharp in the following examples:

   meat Zhangsan buy-Asp three gram DE
   “Zhangsan bought three grams of meat.”

   b. Rou, Zhangsan mai-le san jin *(de). [adjectival DE]
   meat Zhangsan buy-Asp three gram DE
   “Zhangsan bought a chunk of three-gram meat.”

When we apply the test on the durative phrase, as in (20), the P-related durative phrase behaves on a par with numeral-classifiers, and de cannot appear after NP-fronting, while in (21), the “adjectival” durative phrase, which is an adjective modifying NP (i.e., a three-year curriculum high school) requires the presence of de even when the NP is fronted.

(4) Gaozhong, Lisi du-le san nian (*de) e. 
   high-school Lisi study-Asp three year DE
   “Lisi attended high school for three years.”

---

4 The traditional Chinese grammarian, such as Chao (1968), also classifies the durative phrase before the noun as a temporal classifier (shi liang ci).
Evidence from *de* therefore suggests that the post-verbal P-related durative phrase has an underlying structure in (22), comparable to a typical numeral-classifier construction in (23):

(22) a. Lisi du-guo [san nian gaozhong]

     Lisi study-Asp three year high.school

     “Lisi attended high school for three years.”

     b. [CLP sanNum nianCL [NP gaozhong]]

(23) a. Lisi du-guo [san suo gaozhong]

     Lisi study-Asp three CL high.school

     “Lisi attended three different high schools.”

     b. [CLP sanNum suoCL [NP gaozhong]]

3. **A Syntax-Semantics Mismatch**

Having identified that the post-verbal P-related durative phrase is actually a numeral-classifier, we are faced with the serious problem of syntax-semantics mismatch. That is, how can a numeral-classifier phrase measure the verbal-aspectual event in the verbal domain? In what follows, two earlier analyses proposed in Huang (1997) and Huang, Li, and Li (2009) are reviewed. While both analyses are able to account for the surface mismatch, I argue that the numeral-classifier analysis may provide a unified account for the two competing analyses.
3.1. Two Previous Accounts

Huang (1997) and Huang et al. (2009: 97) argue that the surface syntax-semantics mismatch is a surface illusion resulting from a nominalized IP and light verb syntax. The derivation is illustrated as follows:

(24) a. Lisi mai-le yi-nian (de) yu.
Lisi sell-Asp one-year DE fish
“Lisi sold fish for a year.”

Huang’s (1997) original proposal successfully analyzes away the surface syntax-semantics mismatch. The durative phrase modifies the verbal domain in the underlying structure, and it surfaces as an NP modifier due to nominalization of S (or IP). The verb raises to the light verb DO, and such a movement thus yields the surface syntax-semantics mismatch.

An alternative approach to the mismatch problem, also suggested in Huang et al (2009: 98), is to treat the object NP as an “eventive” argument that bears a special theta role, such as the
“Incremental Theme” (Dowty 1991). In this sense, the durative phrase has the semantic function of defining the object NP as an eventive argument that is measured by the durative phrase. In terms of (24), this means that the object “fish” does not refer to the entities of being sold, but is simply an eventive role participating in the “selling” event, much like fish-selling in English (*Lisi did one year of fish-selling*).

3.2. A First Step Toward a Unified Treatment

I argue that the two analyses are not incompatible. In fact, taking the (P-related) durative phrase as the numeral-classifier phrase may unify the two competing analyses. Here, I adopt the approach in Larson (2003), which attempts to unify the measurement of time/event and that of object. That is, the expressions in (25a, b) are equivalent, and *two hours of sleep* in (25b) is analogous to the object-measurement constructions in (26):

(25) a. sleep for two hours  
    b. get two hours of sleep

(26) a. two feet of rope  
    b. two spoonfuls of sugar

Combining the event semantics in Davidson (1967) and the semantics of measurement in Cartwright (1979), Larson proposes that “measurement (M)” is a predicate over propositions, and therefore, just like the object measurement in (27), one can directly measure events by durative phrases, as in (28) (Larson 2003: 251–252):

(27) a. Mary bought two spoonfuls of sugar.
    b. \( M_{\text{spoonfuls}}[\text{the } x: \text{sugar}(x) \& \text{buy}(\text{Mary, } x)]=2 \)

    “Measured in spoonfuls, the amount of sugar bought by Mary is 2.”
Since measurement is often achieved through overt classifiers in Chinese, Larson’s analysis therefore provides a way to cover the two analyses under the same roof. The equivalence between (25a) and (25b) corresponds to Huang’s analysis of nominalization. The nominalization of the VP represents a reanalysis of the durative phrase as numeral-classifier. At the same time, the incremental theme analysis can also be derived from Larson’s proposal. It is natural to think that durative phrases, as “eventive” classifiers, are also able to define the counting roles as “time/event” (see Liao 2014; Liao and Wang 2011). Therefore, the complement NP simply represents an “event participant” at that time/event. The semantic form is illustrated in (29), adopting Larson’s formulation:

(29) a. Lisi mai-le yi-nian (de) yu.

Lisi sell-Asp one-year DE fish

“Lisi sold fish for a year.”

b. Myear[the e: selling(e) & Agent (Lisi, e) & Participant (fish, e)]=1

In the next section, I further examine the correspondence between nominal and verbal domains. I argue that such correspondence may take us far beyond the issue of durative phrase alone, to other syntax-semantics mismatches of similar nature.

4. Beyond Syntax-Semantics Mismatches
Let us dwell upon the cross-categorial correspondence between a syntactic nominal element and its LF scope in the verbal domain. The central question I investigate is how elements in the nominal and verbal domains can correspond to each other. The question calls for a new interpretation of Huang’s nominalization analysis. I argue that the nominal-verbal correspondence reflects a CP-DP parallelism, which allows a nominal element to take a verbal scope at the same height at LF. I support this analysis by examining the cross-linguistic syntax-semantics mismatches. My conclusion is that a proportional principle can be found in UG, much like a linguistic version of the Archimedes’ Principle, formulated in (30):

(30) The “Archimedes’ Principle” in UG

A nominal element may take a parallel scope position in the corresponding verbal domain at LF, and vice versa.

In other words, the height of a nominal element directly entails the height of its potential “verbal scope.” The CP-DP correspondence has long been observed in generative grammar (Abney 1987; Grimshaw 2000; Hiraiwa 2005; Larson and Cho 2003; Liao 2011; Megerdoomian 2008; Ogawa 2001; Riemsdijk 1998; Stowell 1981; Vergnaud 2013, and others). The general idea is that extended projections in a nominal tree and those in a verbal tree should mirror each other, as shown in (31) (modifying Vergnaud 2013), where [F#] represents the functional value of a given category (Grimshaw 2000):5

---

5 I categorize both C-T and Q-D in (31) to the sentence level. This is because in most cases discussed here (in English and Chinese), Quantifier and Determiner can form morphologically indistinctive units. For example, the quantifier every has a definite reading. Likewise, C and T often show collective behaviors (e.g., Case checking; Chomsky 2001). I leave it open whether there are finer distinctions in C-T and Q-D in other languages.
The Archimedes’ Principle predicts that a nominal element is able to scope over a verbal element that carries the same functional value. That is to say, modifiers of N, CL, D, Q (or the heads per se) are able to take LF scope over V, Asp, T, and C, respectively.

I believe that the proposal captures the basic spirit of Huang’s nominalization analysis. Given Grimshaw’s theory, it is natural to think that nominalization may change the aspectual element to the nominal element with the same functional value, which is the numeral-classifier (with the same functional value of \([F1]\) in (31)). The parallel correspondence is illustrated in (32):

(32) The Parallel Event/Object-Level

```
Verbal domain               Nominal Domain
Asp_{[F1]}                  CL_{[F1]}
durative phrase
```

The LF verbal scope of the “durative classifier” in Chinese can therefore be accounted for as a result of the Archimedes’ Principle. Numeral-classifier is parallel to the AspP, and, according to the Archimedes’ Principle, the numeral-classifier phrase (with the functional value [F1]) is able to obtain an LF scope at AspP (which is the verbal element that shares the same functional value). As an aspectual element at LF, it may therefore modify the verbal domain and measure the length of the event contained in the viewpoint aspect.

A related syntax-semantics mismatch in the event-level can also be found in Krifka (1990), who points out an intriguing ambiguity regarding numerals in English:

(33) a. Four thousand ships passed through the lock last year.
    b. The library lent 23,000 books in 1987.

The sentences have two readings. One reading (object-related reading) involves direct counting of the number of objects (there are distinct 4,000 ships and 23,000 books), and the other reading (event-related reading) involves counting the number of events (there might only be 100 ships, but these ships passed through the lock four thousand times, and there might be one thousand books in the library, but these books are lent 23,000 times). Although Krifka (1990) analyzes the different readings as involving different determiners, I suggest that they actually involve different classifiers. This is because in languages like Chinese with overt classifiers, these different readings can be brought about by different classifiers. To wit,
observe the contrasts between the individual classifier and the event classifier in the following pair:  

(34) a. Zuotian you san liang huoche jingguo-le Taipei.
yesterday have three CL-individual train pass-Asp Taipei

“Three (distinctive) trains passed through Taipei yesterday.”
(object-related reading)

b. Zuotian you san ban huoche jingguo-le Taipei.
yesterday have three CL-event train pass Taipei

“Three schedules of trains were through Taipei yesterday.”
(event-oriented reading)

While (34b) is possible in a scenario in which the same train passed Taipei three times, the most salient reading for (34a) is that there were three distinct trains. Given the Archimedes’ Principle, the event-oriented reading of the numeral observed in Krifka (1990) can now be dealt with on a par with the event-measuring durative phrase in Chinese. That is, in the event-related reading, event measurement at LF is made possible for the numeral-classifier phrase by the parallelism between CL and Asp in (32).

6 Another way of expressing the event-oriented reading is through compounds formed by “eventive” noun roots, as in (i), which has an event-oriented reading equivalent to (ii). I leave open here whether the two sentences have any derivational relations:

(i) Meitian you shi ge chuan-ban cong Jiulong dao Xianggang.
every.day have ten CL boat-schedule from Kowloon to Hong.Kong

(ii) Meitian you shi ban chuan cong Jiulong dao Xianggang

every.day have ten CL-event boat from Kowloon to Hong.Kong

(i) = (ii) “There are ten schedules of boats from Kowloon to Hong Kong every day.”
As expected, the Archimedes’ Principle is not limited to durative phrases and event/object-level modification, and we should predict that other instances of syntax-LF mismatches (often referred to as “bracketing paradox”) can be accounted for under the same principle. The expectation is borne out. Let us turn to the predicate-level correspondence in (31). It has been noted that in English, an NP adjective may sometimes modify VP, as shown in (35) (Alexiadou and Schäfer 2010; Larson 1998; and others):7

(35)  

a. John took [NP good [NP care of his patients]].
    = “John took care of his patients well.”

b. John sipped a [NP quick [NP cup of tea]].
    = “John quickly sipped a cup of tea.”

Under the Archimedes’ Principle, we predict that N-level modifiers can have a “verbal scope” over V. This then explains why NP-level adjectives can have the VP-level manner-adverbial readings in (35a) and (35b). The parallel scopes can be illustrated as follows:

---

7 Skeptical readers might wonder why these examples are not possible in Chinese (and are very restricted in other languages as well). At this point, I can only conjecture that the distinction between languages that allow and disallow these types of expressions might be due to some (meta-)linguistic constraint(s) (on the restrictive nature of “bracketing paradox,” see Williams 2003), and I have little to contribute in this paper on that point. However, one might notice that the Archimedes’ Principle does not force the nominal adjective to take a verbal scope; rather, it is a theory that regulates the syntax-semantics mismatch, predicting which cases are (im)possible.
The Parallel Predicate-Level

Verbal domain Nominal Domain
\( V_{[F0]} \) \( N_{[F0]} \)
Modifier phrase

At the same time, the Archimedes’ Principle correctly rules out other impossible cases. For example, it is not possible for NP-level adjectives to modify the whole sentences, as in (37):^8

(37)  a. John took likely care of his patients. ≠ “Likely, John took care of his patients.”

b. John sipped a probable cup of tea. ≠ “Probably, John sipped a cup of tea.”

These implausible cases are ruled out by the Archimedes’ Principle because a NP-modifier is restricted to take a VP scope at LF, and the potential LF scope cannot extend further to other higher projections, like AspP, TP, or CP, given the one-to-one correspondence between N(P) and V(P).^9

---

^8 The sentence in (37b) may be admissible for nominal scope readings (where the adjectives simply modify NPs). Therefore, (37b) can mean (somewhat marginally) “John sipped something that was probably a cup of tea.” Likely, in occasional-constructions below, the adjectives may obtain nominal scope readings (or internal readings in Larson 1998). Because this has little significance for the main points here, I ignore the (internal) nominal scope readings in the following.

^9 The impossible cases can also pose a threat to the event argument approach, since one needs to stipulate that some adjectives can take event arguments, while others cannot.
Let us further examine some nominal adjectives that are able to take sentence-level “verbal scopes.” One classical problem of this type is the occasional-construction (OC) (Bolinger 1967; Larson 1998; Stump 1981; Zimmermann 2003), where the nominal adjective occasional is able to obtain an “OC-reading” that quantifies over the whole sentence at LF, like its adverbial counterpart, occasionally, as shown in (38):

(38) a. The/An occasional sailor strolled by.
    = “Occasionally, a sailor strolled by.”
   
b. Sally heard the/a sporadic shot.
    = “Sporadically, Sally heard a shot.”

At first blush, it appears that the adjectives occasional and sporadic are NP-level modifiers, and hence, they seem to be counterexamples to the Archimedes’ Principle since they are able to take scope over entire sentences (other than the corresponding VP). However, Larson (1998) and Zimmermann (2003) convincingly argue that this type of adjective actually forms a constituent with a determiner under the OC-reading, as in (39a), and they are not NP-modifiers in (39b):

(39) a. [DP/QP [D/Q The/an occasional] sailor] strolled by.
   b. *[DP/QP The/an [NP occasional sailor]] strolled by.

Three pieces of evidence for the complex-determiner analysis are provided in Larson (1998), Stump (1981), and Zimmermann (2003). First, the occasional-adjective can only appear with the definite article the or the indefinite article a(n), but not with other quantifiers, as in (6), showing that there is a strong (local) selection between the occasional-adjective and D:
(6)  a.  [Two occasional sailors] strolled by.
    ≠ Occasionally, two sailors strolled by.

  b.  [Every occasional sailor] strolled by.
    ≠ Occasionally, every sailor strolled by.

Second, under the OC-reading, the *occasional*-adjective must be adjacent to the determiner, and cannot be interfered by another adjective, as in (41):

(41)  The/a well-dressed occasional sailor strolled by.
    ≠ Occasionally, a well-dressed sailor strolled by.

Third, the *occasional*-adjective cannot be coordinated with an NP-modifying adjective phrase, as in (42), which again indicates that *occasional* is not a typical NP-modifier in its syntactic distribution:

(42)  [The/an occasional and well-dressed sailor] strolled by.
    ≠ Occasionally, a well-dressed sailor strolled by.

The Archimedes’ Principle correctly predicts that the *occasional*-type of adjective, which is able to take a sentence-level verbal scope, should be a modifier of a higher functional category (D) in the nominal domain, and it cannot be treated as an NP-modifier. Since the OC-adjectives are modifiers of D, according to the Archimedes’ Principle, the OC-adjective should be able to obtain an LF scope at the sentence-level, as shown in (43):
Still another sentence-level cross-domain mismatch can be found in quantifiers. In the widely accepted semantic theory of Generalized Quantifier, it is assumed that quantifiers scope over the entire sentences/propositions (Barwise and Cooper 1981; Keenan 2002, just to name a few). This naturally falls under the Archimedes’ Principle. The sentence-level C-Q parallelism is again shown in (43).

Due to space limitations, I can only speculate on this last point, but if quantifier raising (QR) is taken to be an instance of parallel scope, rather than LF movement, many of the theory-internal problems generated by QR might be neutralized (for a critical review of this issue, see Johnson 2000).

5. Conclusion

I have argued that the three readings of durative phrases in Chinese correspond to three distinctive syntactic structures. Especially, I argued that syntactically, the P-related durative phrase should be analyzed as the numeral-classifier, and the numeral-classifier analysis brings about a syntax-semantics mismatch. That is, a nominal numeral-classifier is able to modify the verbal aspectual phrase at LF. I argued that this syntax-semantics mismatch comes from an underlying CP-DP parallelism, subject to the Archimedes’ Principle in UG,
which suggests that the syntactic height of a nominal element directly entails the height of its potential verbal scope at LF. I have provided empirical evidence for the claim by examining several instances of syntax-semantics mismatches in Chinese and in English. The result suggests that despite surface discrepancies, syntax-semantics mismatches are indeed systematically governed by an underlying principle of UG.

References


