In wh-in-situ languages like Mandarin Chinese, although the wh-phrase in a wh-question remains in its canonical argument position, syntactic theories generally posit a dependency between the in-situ wh-phrase and a higher scope position (i.e. a clause edge [spect, CP] position) at which the wh-phrase is interpreted (Huang, 1982; Tsai, 1994). In the current study, two eyetracking reading experiments showed that (i) such covert long-distance dependencies are indeed being constructed online for wh-in-situ constructions; and (ii) preliminary evidence suggests that a direct access cue-based retrieval mechanism (Lewis & Vasishth, 2005; Van Dyke & Lewis, 2003) and a serial search mechanism (Dillon, 2011) may both be available for the parser, but the choice between the two is sensitive to the initial encoding of the retrieval target.

Expt1(n=50; item n=64) Expt1 tested embedded wh-questions. The two most critical conditions differ only in the embedded verb (only English gloss and translation is provided below). The scope position for the wh-in-situ phrase always follows the matrix predicate "wonder", as indicated by the position of the overtly fronted wh-phrase in the English translation:

(1) a.reporter wonder mayor **lead** city council punish **which official**. **(Serial Verb)**
"The reporter wondered [$_{CP1}$ *which official* the mayor led the city council to punish]"

b.reporter wonder mayor **announce** city council punish **which official**. **(MultiCP)**
"The reporter wondered [$_{CP1}$ *which official* the mayor announced [$_{CP2}$ that the city council punished]]".

Even though there is no overt finiteness/non-finiteness marking in Chinese, based on other syntactic diagnostics (Grano, 2012; Paul, 2005), it has been shown that the embedded verb "lead" in the Serial Verb condition, similar to its English counterpart, selects a complement structure that is NOT a full fledged clause. The embedded verb "announce" in the MultiCP condition, on the other hand, selects a regular CP (clause) complement. The MultiCP condition therefore structurally contrasted with the Serial Verb condition by introducing an intervening CP2 position. We further assume that when the in-situ wh-phrase is encountered, the relevant cues to retrieve the correct scope position are [+CP, +Q], with [+CP] meaning a clause edge position, and [+Q] meaning a particular feature on the CP position that will allow an interrogative (i.e. a question) to be interpreted at this position. No other retrieval cues are available since there isnt' any morpho-phonological marking on the scope position. Given this set of retrieval cues, we predict processing cost in the MultiCP condition due to memory interference from the intervening CP2, but not in the Serial Verb condition. This prediction is borne out. On the in-situ wh-morpheme ("which" in (1), excluding the sentence final head noun "official"), we found a significantly longer regression path reading time for the MultiCP vs. the Serial Verb condition. There is no difference between the two other declarative control conditions (e.g. "The reporter knew the mayor led (announced that) the city council to punish (punished) that official."). The reading time difference between (1a) and (1b) is also mirrored in the binary acceptability judgments, supplied by the participants after each trial in the eyetracking study—(1b) was judged significantly worse than (1a) (70% vs. 93%).

Experiment 1 confirms that the parser indeed constructs a covert dependency between a wh-in-situ phrase and its scope position, as demonstrated by the fact that intermediate clause edge position leads to extra cost. Even though we have casted the parsing mechanism that accesses the silent scope position as a cue-based memory retrieval mechanism, and attributed the cost in the MultiCP condition to memory interference, the results above are also compatible with a serial search mechanism, under which the parser serially checks through each CP edge position to find the right scope position. Under this approach, the additional cost in (1b) vs. (1a) could be due to the additional step the parser takes to initially examine the intermediate CP2 position before moving on to the next CP1 position. Furthermore, the matrix verb "wonder" in (1) obligatorily selects for a [+Q] complement (e.g. as shown by the unacceptable sentence "The reporter wondered that the mayor punished that official", in which the complement after "wondered" is a [-Q] declarative). This may have made a very salient initial encoding of a [+Q] feature on CP1 in (1b). A direct cue-driven access to CP1 may not be equally available if the initial encoding of the [+Q] feature on CP1 is less salient. We address these issues in Expt2.

Experiment 2 (ongoing)—Two modifications were made for Experiment 2. **First**, we contrasted the matrix verb "wonder" with a matrix verb like "find out". As stated above, "wonder" triggers a strong initial encoding of [+Q] on CP1; but "find out" is lexically compatible with both an interrogative [+Q] and a declarative [-Q] complement, and additional

sentence completion norming studies suggest that participants prefer a declarative [-Q] encoding on CP1 (i.e. very rarely participants continued "find out" with an embedded question). **Second**, in addition to the original Serial Verb condition, we also included two kinds of MultiCP conditions: one with an embedded verb like "announce", which, like "find out", lexically subcategorizes for either a [+Q] or a [-Q] sentential complement (MultiCP, +ambCP2 conditions); and the other with an embedded verb like "believe", which only subcategorizes for a [-Q] sentential complement (MultiCP, -ambCP2 conditions). It is important to note that (2e) is ambiguous between two different scope readings.

(2) **Matrix verb "wonder"-- Strong** initial [+Q] encoding on CP1
a.reporter **wonder** mayor **lead** city council punish **which official**. **(Serial Verb)**
"The reporter wondered [$_{CP1}$ *which official* the mayor led the city council to punish]"
b.reporter **wonder** mayor **announce** city council punish **which official**. **(MultiCP,+ambCP2)**
"The reporter wondered [$_{CP1}$ *which official* the mayor announced [$_{CP2}$ that the city council punished]]".
c.reporter **wonder** mayor **believe** city council punish **which official**. **(MultiCP, -ambCP2)**
"The reporter wondered [$_{CP1}$ *which official* the mayor believed [$_{CP2}$ that the city council punished]]".

Matrix verb "find out"-- Weak initial [+Q] encoding on CP1
d.reporter **find out** mayor **lead** city council punish **which official**. **(Serial Verb)**
"The reporter found out [$_{CP1}$ *which official* the mayor led the city council to punish]"
e.reporter **find out** mayor **announce** city council punish **which official**. **(MultiCP,+ambCP2)**
"The reporter found out [$_{CP1}$ *which official* the mayor announced [$_{CP2}$ that the city council punished]]".
Or "The reporter found out [$_{CP1}$ the mayor announced [$_{CP2}$ *which official* the city council punished]]".
f.reporter **find out** mayor **believe** city council punish **which official**. **(MultiCP, -ambCP2)**
"The reporter found out [$_{CP1}$ *which official* the mayor believed [$_{CP2}$ that the city council punished]]".

For the matrix verb "wonder" (2a-c), we replicated the effects found in Expt1. Both MultiCP conditions are more costly/difficult than the Serial Verb condition, and no difference was found between the two MultiCP conditions, suggesting that due to the obligatory [+Q] requirement of "wonder", the embedded CP2 is always/only encoded as [-Q], despite the fact that "announce" is lexically ambiguous in its subcategorization properties. The most interesting effect for the matrix "find out" conditions is that between the two MultiCP conditions, the ambiguous (2e) is less costly/difficult than the unambiguous 2f (in terms of both regression path RTs and acceptability judgments). The data collection is ongoing, and we are exploring two hypotheses. **First**, contrary to our finding, a direct-access cue-based memory retrieval mechanism may have predicted that the ambiguous (2e) is more costly than the unambiguous (2f), due to competition or interference between the two possible scope sites. On the other hand, a serial search mechanism that ranks the closest CP2 to be the first retrieval target derives the right contrast if we assume (i) the CP2 after "announce" in (2e) is a good scope position, whereas the CP2 after "believe" in (2f) is not; and (ii) given the acceptability judgment task, the parser could terminate its search for (2e) at CP2, but it needs to search further for the correct scope position in (2f). If this hypothesis is on the right track, it suggests that both the direct-access cue-based retrieval and the serial search mechanism are available for the parser, but the choice between the two is modulated by the feature salience/strength that was initially encoded on the retrieval target—a strong [+Q] encoding on CP1 under "wonder" guides a cue-based retrieval, whereas a weak [+Q] encoding on CP1 under "find out" triggers serial search. The first hypothesis crucially assumes that the ambiguity advantage of (2e) poses a problem for the direct access cue-based retrieval, but the **second** hypothesis is that the ambiguity advantage in (2e) is actually predicted by the cue-based model, assuming a parallel "race" between the two parses that associate the in-situ wh-phrase to different scope positions (Logačev&Vasishth, 2015; van Gompel et al., 2000). These two hypotheses could be distinguished by examining an additional condition (3), which is modified from (2f) by switching the positions of "believe" and "find out":

(3) reporter **believe** mayor **find out** city council punish **which official**.
"The reporter believed [$_{CP1}$ the mayor found out [$_{CP2}$ *which official* the city council punished]]".

Comparing the ambiguous (2e) and (3), Hypothesis Two above would still predict ambiguity advantage. But Hypothesis One would predict no difference between the two conditions, since in both cases, the parser could access CP2 first and form a grammatical parse at that point, and then terminate the search.