Mandarin *ne* as Contrastive Topic*

The Case of CT Questions

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1. Introduction

In this paper, I propose that the distribution of the Mandarin discourse particle *ne* can be captured using a modified version of the pragmatics for contrastive topic (CT) laid out in Büring 2003. Section 2 draws out several predictions of Büring's analysis for where CT marking will be licensed. Section 3 demonstrates that *ne* indeed follows the familiar pattern. Section 4 presents the appearance of *ne* in questions, which is unexpected on Büring's account, and shows how these examples can be incorporated via simple modifications to Büring's CT-congruence condition and the definition of CT-value. Section 5 discusses the impossibility of *ne* on questions of clarification, and introduces a general mechanism for interruptions that accounts for why these questions resist CT marking. Section 6 concludes.

2. Büring 2003

In this section, I review the main components of Büring's d-trees theory of CT, and go on to derive some corollary predictions that can help us in identifying CT morphemes in other languages.

Büring (2003) proposes that the discourse congruence condition in (2) accounts for the distribution of the English CT contour, as exemplified in (1). Intuitively, what (2) says is that CT marks a response to a question which is part of a larger strategy (a set of questions) delimited by the *CT-value* of the response, defined in (3). The contrastive topic value of B's response in (1) is given in (4), and (5) provides a discourse tree that would support this fragment. Here and throughout, CAPITALS are used to indicate the presence of stress above the word-level, wherever relevant.

(1) <u>CT Contour (CT+F)</u>

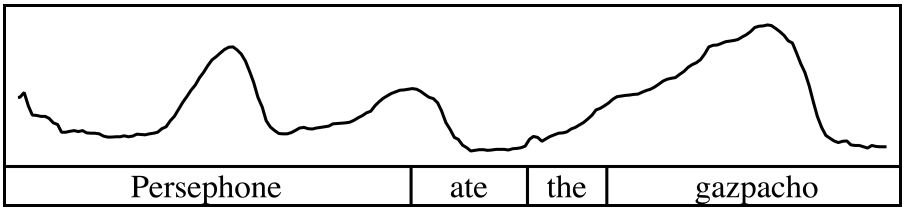
A: Well, what about PERSEPHONE? What did SHE eat?

B: [PERSEPHONE]$_{CT}$ … ate [the GAZPACHO]$_{F}$.

[(L+)H* L^{-} H%]$_{IntP}$ [H* L^{-} L%]$_{IntP}$

[TOPIC] [COMMENT]

* This paper explodes a small piece of a larger manuscript that (a) defends the need for separating CT *ne* and aspectual *ne*, (b) addresses specific previous analyses of *ne*, and (c) presents a preliminary theory for the syntax of *ne*. I am very grateful to the following people for discussion of this material: Seth Cable, Chris Davis, Tom Ernst, Lyn Frazier, Chloe Chenjie Gu, Kyle Johnson, Angelika Kratzer, Chris Potts, Lisa Selkirk, Michael Wagner, Ellen Woolford, and audiences at UMass Amherst, and the Barcelona 2009 Workshop on Prosody and Meaning. For discussion of the judgments in both versions, I wish to thank Bitian Zhang, Chloe Chenjie Gu, Ye Li, Misato Hiraga, and Masashi Hashimoto. Also, special thanks are due to Seth Cable, Lyn Frazier and Angelika Kratzer for detailed comments on the longer version. All remaining errors are my own.



(2) CT-Congruence (Büring 2003: 520)

An utterance U containing a contrastive topic can map onto a move M_U within a d-tree D only if U indicates a strategy around M_U in D.

U indicates a strategy around M_U in D iff there is a non-singleton set Q′ of questions such that for each $Q \in Q'$ —

(i) Q is identical to or a sister of the question that immediately dominates M_U, and
(ii) $[\![Q]\!]^o \in [\![U]\!]^{ct}$

(3) CT-Value (Büring 2003: 539)

$[\![A]\!]^{ct} =$

a. if A is F-marked, $\{ D_{type(A)} \}$
b. otherwise, if A is CT-marked, $\{ \{\alpha\} \mid \alpha \in D_{type(A)} \}$
c. otherwise, if A is a terminal, $\{\{ [\![A]\!]^o \}\}$
d. otherwise, if A = [B], $[\![B]\!]^{ct}$
e. otherwise, if A = [B C], $\{ \beta \mid \exists b,c [\ b \in [\![B]\!]^{ct} \ \&\ c \in [\![C]\!]^{ct} \ \&\ \beta = \{ \alpha \mid \exists b',c' [\ b' \in b \ \&\ c' \in c \ \&\ \alpha = b' + c' \ ] \ \} \ ] \ \}$

Informal: "The CT-value of an utterance is the set of alternatives given by making substitutions in first the focus position and then the topic position."

(4) $[\![\text{ [Persephone]}_{CT} \text{ ate [the gazpacho]}_F]\!]^{ct}$

$= \{ \{ x \text{ ate } y \mid y \in D_e \} \mid x \in D_e \}$

$= \left\{ \begin{array}{l} \{ \text{Antonio ate the ceviche, Antonio ate the gazpacho, …} \} \\ \{ \text{Persephone ate the ceviche, Persephone ate the gazpacho, …} \} \\ \ldots \end{array} \right\}$

$\approx$ For each person, what did they eat?

(5) d-tree for (1)

Question: For each person, what did they eat?

Sub-Question: What did Persephone eat?
Sub-Answer: Persephone ate the gazpacho.

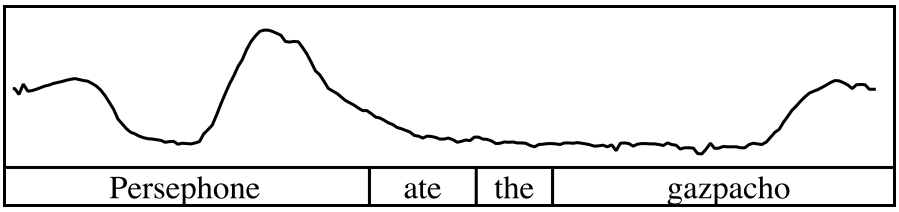
Sub-Question: What did Antonio eat?
Sub-Answer: Antonio ate the ceviche.

Besides appearing in CT+F contours, the contrastive topic tune may also occur in isolation, as in (6). Büring (2003: 532) does not offer a complete account of "sole CT" contours, but suggests that these could be integrated under his analysis, on the assumption that the meaning of a polar question is the singleton set containing its literal meaning. I follow this assumption here, so that for example, (6) will have the CT-value in (7), and will be congruent with a d-tree like (8).

(6) Sole CT

A: Did Persephone and Antonio eat the gazpacho?

B: [PERSEPHONE $]_{CT}$ ate the gazpacho… (… but Antonio didn't.)
[(L+)H* L⁻ H% $]_{IntP}$



(7) $[\![[\text{Persephone}]_{CT} \text{ ate the gazpacho…}]\!]^{ct}$

$= \{ \{ x \text{ ate the gazpacho} \} \mid x \in D_e \}$

$= \{ \{\text{Persephone ate the gazpacho}\}, \{\text{Antonio ate the gazpacho}\}, \ldots \}$

$\approx$ For each person, did they eat the gazpacho?

(8) d-tree for (6)

Question: For each person, did they eat the gazpacho?

Sub-Question: Did Persephone eat the gazpacho?
Sub-Answer: Persephone ate the gazpacho.

Sub-Question: Did Antonio eat the gazpacho?
Sub-Answer: No, Antonio didn't eat the gazpacho.

In addition to the CT-congruence condition, which restricts the mapping from utterances to moves within d-trees, Büring (2003) imposes several conditions on the structure of d-trees themselves. These include the familiar requirements that discourse moves be relevant and informative (Büring 2003: 517–

518, 541), as well as the following restriction against a sub-answer single-handedly resolving a super-question:

(9) Principle of Highest Attachment (Büring 2003: 534, 540)

If M is a complete answer to Q (i.e., if $[\![M]\!]^o$ logically entails p or W−p for every $p \in [\![Q]\!]^o$), Q immediately dominates M.

Combining CT-congruence with the minimality condition in (9), we can derive the corollary in (10), which serves as one useful diagnostic[1] for CT marking. This corollary is illustrated by the examples in (11–12).

(10) CT marking is infelicitous on any assertion that resolves all the questions in its CT-value.

(11)[2] #[EVERYONE]$_{CT}$ … ate [the GAZPACHO]$_F$.

$[\![(11)]\!]^{ct} \approx$ { What did Persephone eat?, What did Antonio eat?, … }

(12) #[EVERYONE]$_{CT}$ ate the gazpacho…

$[\![(12)]\!]^{ct} \approx$ { Did Persephone eat the gazpacho?, Did Antonio eat the gazpacho? … }

Another useful corollary of CT-congruence in combination with the minimality condition in (9) is the following:

(13) CT marking is infelicitous on a complete answer to the question under discussion, unless that question is construed as a sub-question of a larger question.

This corollary captures the fact that (14b) is infelicitous unless the answer is taken to be non-resolving —for example, if the question is interpreted as asking for a list of people. It also captures the fact that (15b) is infelicitous unless A's question is construed as part of a larger question, namely *Where was everyone?*

(14) A: Who spilled coke on my computer?
B: [JOHN]$_{CT}$ did…

(15) A: Where were you (at the time of the murder)?
B: [I]$_{CT}$ was [at HOME]$_F$. [Büring 2003: 523; Roberts 1996: 122]

1 In the case of sole CT, this property could be restated as: "CT can't mark an utterance that resolves its own focus alternatives." Seth Cable (p.c.) points out that this property also holds of focus quantifiers like *even* and *only* (e.g. #Only [everybody]$_F$ came). Thus, the diagnostic in (10) should be taken as a necessary but not a sufficient condition on a morpheme being identified as CT.

2 Note that the felicity of (11) actually depends on the structure of the larger question at hand. I've assumed here that the larger issue is figuring out for each person the unique food that they ate. However if people ate many things, and the goal is to find out for each proportion of the people, what food was eaten by that proportion of people, then (11) is felicitous, as it only answers a sub-question of the larger issue.

Finally, although Büring does not discuss these cases, it is important to observe that in the case of sole CT, the constituent marked as contrastive topic can be as large as an entire proposition-denoting utterance. In this limiting case, the questions making up the CT-value are unrestricted in structure, and CT-congruence imposes only the weak requirement that the discourse contain at least one polar question that is sister to the question under discussion. Put differently, broad CT on an assertion marks a partial answer to some question that can be broken down into a set of polar questions. In (16), for example[3], CT marks B's response as a partial answer to the question of whether John is home, with potential polar sub-questions given in (17).

(16) A: Is John home?
B: [His LIGHTS are on]$_{CT}$ … (but then, maybe he went out and forgot to turn them off.)

$[\![\text{(16B)}]\!]^{ct} = \{ \{ p \} \mid p \in D_{\langle s,t \rangle} \}$

(17) d-tree for (16)

Question: Is John home?

Sub-Question: Are his lights on?
Sub-Answer: His lights are on.

Sub-Question: Can we infer from the fact that his lights are on that he's home?
Sub-Answer: …

Examples of broad CT focus also highlight a fact about focus marking in general, which is that determining the placement of stress within a large focused constituent is a non-trivial task. In (16), for example, what tells us that the CT accent will fall on *lights*, as opposed to *on*? This problem of *focus projection* is discussed by Selkirk (1984) and remains an area of active research. For our purposes, it will suffice to recognize, along with Büring (2003: 527 ff. 12), that stress on a single word may indicate either narrow focus on that word, or potentially broad focus on a larger constituent[4].

3. Mandarin *ne* as CT

Mandarin *ne* appears in two positions, which I will describe as *topic-marking* and *sentence-final*:

(18) Topic-Marking *ne*

māma měi-tiān wǎnshàng hěn wǎn cái huí-jiā. BÀBA **ne**, gāncuì jiù bù HUÍ-lái.
mom every-day night very late only.then return-home dad NE simply just not return-come
'Every day mom doesn't come home until late. Dad NE, doesn't even come back at all.'
[Shao 1989: 174]

3 In (16), the sub-question is implicit, but another logical possibility is that the super-question is implicit, as in:

(i) A: Did the teacher like your presentation?
B: [The TEACHER]$_{CT}$ liked it… (but everyone else hated it.)

4 In the case of (16), since the predicate is unaccusative, the accent on the subject is the "default stress" pattern, and is thus compatible with narrow or broad focus, as discussed recently by Kahnemuyipour (2004: 131–145), and Selkirk and Kratzer (2007: 111–123).

(19) Sentence-Final *ne*

A: zhāngsān yào qù kāi-huì ma?
Zhangsan will go have-meeting PRT
'Is Zhangsan going to the conference?'

B: tā SHUŌ yào qù **ne**… dànshì tā hái méi mǎi jī-piào.
he say will go NE but he still have.not buy plane-ticket
'He *said* he's going NE… but he still hasn't bought a plane ticket.'

The question of how many different *ne's* there are, and what they mean has been debated for decades. Chao (1968) catalogs seven distinct uses of *ne* falling into two classes; however the distinction between topic-marking and sentence-final *ne* cuts across these two classes, and it is unclear which if any of the uses should count as related. Lin (1984), on the other hand, argues that all instances of *ne* are essentially the same, and share a core of marking *contrast*. More recently, Li (2006) proposes that sentence-final uses instantiate one class, and are essentially different from topic-marking uses.

I adopt a different view of which *ne's* are doing what, but I will not argue for it in detail here, for reasons of space. On my account, *some* sentence-final uses of *ne* and *all* topic-marking uses of *ne* are instances of contrastive topic marking, parallel to English CT intonation. However I maintain that contra Li and Thompson (1981), Lin (1984), Wu (2005), Chu (2006), Li (2006) and others, it is necessary to distinguish at a fundamental level uses of sentence-final *ne* that are *aspectual*, conveying (or at the very least depending on) the existence of a continuing state, or progressive action. These uses, as exemplified by (20) below, have a unique distribution, and can be shown to categorically fail diagnostics for CT meaning.

(20) tā ná-zhe huār **ne**.
she hold-ASP flower NE
'She is holding a flower NE.'

The remainder of the paper, while avoiding explicit discussion of aspectual *ne*, presupposes the need to keep ne_{CT} and ne_{ASP} separate. If this assumption is justified, then to get a clear picture of the distribution of ne_{CT}, we need to control for ne_{ASP}. Specifically, any example purporting to demonstrate a distributional fact about sentence-final ne_{CT} must have properties that rule out the possibility of aspectual *ne*. Following Chan (1980: 61), this involves selecting predicates that either (a) describe events lacking duration, (b) describe situations which have terminated, or (c) contain complements denoting the frequency, extent, or duration of an action.

It is useful to ask how the positioning of Mandarin *ne* and the prosody of CT *ne* constructions compares to the phonology of CT in English. The English CT contour is usually taken to consist of a specific pitch accent (L+)H* within a specific type of intonational phrase (L⁻ H%). However, following Steedman (2000), Büring (2003: 537) claims that the H% boundary tone is the true locus of CT marking. Pitch accents within the CT constituent, rather than counting as part of the CT construction itself, are taken to be typical instances of F-marking, whose distribution is controlled by a general theory of pitch accent placement like Schwarzschild's (1999).

Remarkably, Mandarin *ne* has precisely the distribution that Büring would expect of a CT marker, corresponding directly to the English H% CT boundary tone. Like English H%, Mandarin *ne* follows the fronted topic constituent in CT+F constructions, and appears sentence finally in sole CT constructions[5].

While the occurrence of H% or *ne* cues the presence of CT, it is insufficient for determining which constituents are CT-marked, which is a prerequisite to computing the CT-value of an utterance. The fact that we can't infer which constituent is CT-marked from the location of H% is not made clear in Büring 2003. While Büring goes as far as detaching CT-marking from CT-internal pitch accents, he does not address the phonology of sole CT, where the boundary tone may occur at a distance from the contrastive topic itself, as in (6), (14), and (16). Examples like these show the need to revise the claim (2003: 537) that "CT-marking is realized by a boundary tone *on the constituents so marked*" (emphasis mine).

As in English, the cue to which constituent is CT-marked in Mandarin is the prosodic prominence associated with focus marking. The phonetic correlates of Mandarin focus are known to include pitch range expansion, articulatory strength, and duration (Chen 2002, Xu 2004), and their combination is fairly accessible to native speakers on an intuitive level in terms of *weight*.

Examples (21–22) are repeated from above, with the addition of CT- and F-marking. Note, however, that CT-marking does not entail any particular kind of stress or accent[6]. In fact, this again is familiar from English, where Büring (2003: 537) reminds us that, at least when the optional (L+) rise is omitted, the H* accent within a contrastive topic is no different from the H* marking the focused constituent. These examples also show that as in English (Selkirk 1984), prominence on a single word can "project" to larger constituents, giving rise to ambiguities in focus marking.

(21) māma měi-tiān wǎnshàng hěn wǎn cái huí-jiā. [BÀBA]$_{CT}$ **ne**, [gāncuì jiù bù HUÍ-lái]$_{F}$.
mom every-day night very late only.then return-home dad NE simply just not return-come
'Every day mom doesn't come home until late. Dad NE, doesn't even come back at all.'

$$[\![(21)]\!]^{ct} = \left\{ \begin{array}{c} \{ \text{Mom returns on time, Mom returns late, Mom doesn't return, … } \} \\ \{ \text{Dad returns on time, Dad returns late, Dad doesn't return, … } \} \\ \ldots \end{array} \right\}$$

≈ For each person, when do they get home each day?

5 The question of why H% and *ne* show up sentence-finally in sole CT constructions is still an open one, and I will not resolve it here. However I note in passing that this distribution is distinct from that of CT particles like Japanese *wa* or Korean *(n)un*, which appear closer to the CT constituent.

6 Wang and Xu (2006) present experimental evidence that Mandarin initial new topics are encoded with a *raised* pitch range, while initial focus is encoded with an *expanded* pitch range and post-focal compression. While it is clear that Mandarin initial topics are set off prosodically (providing a possible explanation for the lack of post-topic compression), it is not clear whether topic and focus are robustly distinguished by the type of emphasis they carry. In fact, it seems likely that the corrective contexts used for eliciting focus would trigger a paralinguistic strengthening resulting in gradient pitch expansion. Furthermore, as Wang and Xu (2006) mention in their discussion, the new topic items have the unique property within the experiment of being discourse-initial, and this may be responsible for their raised pitch.

(22) A: zhāngsān yào qù kāi-huì ma?
Zhangsan will go have-meeting PRT
'Is Zhangsan going to the conference?'

B: tā [SHUŌ yào qù]$_{CT}$ **ne**… dànshì tā hái méi mǎi jī-piào.
he say will go NE but he still have.not buy plane-ticket
'He *said* he's going NE… but he hasn't bought a plane ticket.'

⟦ (22B) ⟧^{ct} = { {He said he will go}, {He will go}, … }

Recall that according to Büring's theory, CT marks a partial answer to a large issue, broken down into a strategy of sub-questions within the CT-value of the utterance. We can observe that the CT-marked utterances in (21) and (22) do indeed satisfy this requirement. In (21), the CT-marked sentence answers the implicit question of when dad gets home every day, and this question is indeed preceded by the implicit sister question of when mom gets home each day. Furthermore, these questions are contained within the CT-value of the CT-marked response[7]. In (22), B's response is indeed a partial answer to the larger question of whether Zhangsan will go or not, contributing an answer to the implicit sub-question of whether Zhangsan *said* he will go. The relevant sister sub-question in this case is the upcoming question of whether, given that he said he'll go, he will actually go or not, and both sub-questions are contained in the CT-value of B's response.

Having observed that the above examples of *ne* are compatible with Büring's pragmatics for CT, we can also test *ne* against the diagnostics presented in section §2 and repeated below. The goal of applying these diagnostics is to show that *ne* is infelicitous in the environments we expect CT to be impossible.

(23) Corollaries Repeated from (10) and (13)

a. CT marking is infelicitous on any assertion that resolves all the questions in its CT-value.

b. CT marking is infelicitous on a complete answer to the question under discussion, unless that question is construed as a sub-question of a larger question.

In the minimal pair below, (24a) has a non-maximal CT *most*, where in (24b) the CT is the maximal element *all*. The CT-value of the two examples is the same[8], but only in the case of (24b) does the assertion resolve all of the questions in its CT-value. Thus, the impossibility of *ne* in (24b) falls out immediately from corollary (23a) on the assumption that *ne* marks CT.

7 The reader may note that technically speaking, the questions in the CT-value of (21) could be asking about any entity, not just people, and the predicates within the answers to these questions could be any property, not just getting home at particular times. To prevent unrelated questions like *What properties does the moon have* from being part of the CT-value, we need to add the restriction that focus alternatives be contextually salient.

8 It is not clear whether the CT constituent in these examples is the entire subject DP, or just the quantifier. In either case, the restrictor noun *shìqing* 'matter' is given, and the contextually salient alternatives have the form *X of these things*.

(24) a. [**DÀBÙFEN**]$_{CT}$ de shìqing **ne** [dōu hěn nán-bàn]$_{F}$.
most DE matter NE DISTR very difficult-manage
'*Most* of these things NE are hard to deal with.'

b. [**SUǑYǑU**]$_{CT}$ de shìqing (**#ne**) [dōu hěn nán-bàn]$_{F}$.
all DE matter NE DISTR very difficult-manage
'*All* of these things (#NE) are hard to deal with.'

$$[\![\text{(24ab)}]\!]^{ct} = \left\{ \begin{array}{l} \{ \text{Some of these things are hard, Some of these things are easy, …} \} \\ \{ \text{Most of these things are hard, Most of these things are easy, …} \} \\ \{ \text{All of these things are hard, All of these things are easy, …} \} \\ \ldots \end{array} \right\}$$

≈ How difficult are (each subset of) these things?

It's worth highlighting that without *ne*, (24b) is felicitous, and would be supported as an instance of contrastive *focus*, in a context like (25). In addition to demonstrating that nothing apart from the appearance of *ne* is wrong with (24b), this example is a useful counter to theories that treat *ne* in broad terms as a general marker of contrast. Specifically, it is not clear how the analyses of Lin (1984) or Chu (2006) will prevent *ne* from marking contrastive focus.

(25) A: něi xiē shìqing bǐjiào nán-bàn?
which few thing fairly difficult-manage
'Which of these things are relatively hard to deal with?'

B: **SUǑYǑU** de shìqing dōu hěn nán-bàn.
all DE matter DISTR very difficult-manage
'*All* of these things are hard to deal with.'

Moving on to our second diagnostic, if *ne* marks CT, we expect it to resist completely resolving answers, unless some larger issue remains unresolved. One such case is (26), where B's canonical direct answer cannot be *ne*-marked, as it completely resolves the issue at hand.

(26) A: tā shuō shénme le?
he say what PRT
'What did he say?'

B: tā shuō yào qù (**#ne**).
he say will go NE
'He said he's going (#NE).'

On the other hand, if B's answer is taken to be non-resolving of a larger salient issue, then *ne* is licensed. Suppose for example that what A is really trying to determine is whether or not Zhangsan will present a paper at the conference. In this case, B's response that Zhangsan is going can be interpreted as a partial answer, and accepts *ne*:

(27) A: tā shuō shénme le?
he say what PRT
'What did he say?'

B: tā shuō [yào QÙ]$_{CT}$ **ne**, dànshi tā jiǎng bù jiǎng wǒ bù quèdìng.
he say will go NE but he speak not speak I not certain
'He said he's going NE, but I'm not sure whether he'll give a talk.'

In summary, we've seen that both topic-marking and (non-aspectual) sentence-final *ne* in assertions can be successfully analyzed as a marker of contrastive topic under the d-trees theory. Acceptable uses of *ne* respect Büring's CT-congruence condition, and in the specific environments where CT is predicted to be impossible, *ne* is indeed infelicitous.

4. CT Questions

Büring (2003: 519 ff. 7) suspects that CT marking is impossible in questions, and asserts that CT-values are only defined for declaratives. However, it is not clear what in Büring's model would prevent us from calculating the CT-value of a question, as we will see shortly. In fact, this is an asset, since CT markers do show up in questions, as Tomioka (2010: 121) observes for Japanese CT *wa*, and the pragmatics of these questions seems closely related to that of CT declaratives:

(28) … Zyaa Erika-**WA** doko-e itta-no?
… then Erika-CT where went-Q
'…, well then, where did ERIKA go?'

Similarly, Mandarin CT *ne* can occur sentence-finally[9] in questions like A's second query in the following exchange. Note however that *ne* is impossible on A's first question, which occurs out of the blue.

9 Whether *ne* occurs in its *topic-marking* form in questions is an interesting question which I will not resolve here. The following example from Chu (2006: 10) may be one such a case:

(i) NÈI běn shū **ne**, nǐ kàn-wán le méi-yǒu?
that CL book NE you read-finish PRT not-have
'*That* book NE, have you finished?' (more loosely, 'Have you finished *that* book?')

However another possibility is that this example actually consists of two questions, the first being a so-called "truncated" or "thematic" question (see Li 2006), and the second being a full question with a null pronoun, as in (ii). If this second analysis is correct, then identifying this instance of *ne* as sentence-final or topic-marking depends on our theory of truncated questions.

(ii) NÈI běn shū **ne**? nǐ kàn-wán le méi-yǒu?
that CL book NE you read-finish PRT not-have
'And *that* book NE? Have you finished it?'

(29) Context: A calls B on the phone out of the blue.

A: nǐ xiǎng bù xiǎng jīntiān wǎnshàng chū-qù chī huǒguō (**??ne**) ?
you want not want today night out-go eat hotpot NE
'Do you want to go out for hotpot tonight (??NE) ?'

B: bù tài xiǎng.
not too want
'Not really.'

A: (nà) nǐ xiǎng bù xiǎng chī [SHUǏ-ZHǓ-YÚ]$_{CT}$ **ne**?
then you want not want eat water-boil-fish NE
'Then do you want to have *boiled fish* NE?'

We've seen that CT on an assertion marks a response to a sub-question within a larger strategy, whose makeup is constrained by the CT-value of the declarative. Based on the translations of (28–29), we can posit that CT on questions simply marks sub-questionhood within a strategy, and that the CT-value constrains the shape of sister sub-questions. To make this concrete, let's modify the CT-congruence condition as follows (with changes in bold):

(30) CT-Congruence (**ideal version**, adapted to handle CT questions)

An utterance U containing a contrastive topic can map onto a move M_U within a d-tree D only if U indicates a strategy around M_U in D.

U indicates a strategy around **assertion** M_U in D iff there is a non-singleton set Q′ of questions such that for each $Q \in Q'$ —

(i) Q is identical to or a sister of the question that immediately dominates M_U, and
(ii) $[\![Q]\!]^o \in [\![U]\!]^{ct}$

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(i) Q is identical to or a sister of $\mathbf{M_U}$, and
(ii) $[\![Q]\!]^o \in [\![U]\!]^{ct}$

Having extended CT-congruence to cover question moves, what remains is to ensure that the CT-value of a question with CT marking is the same as the CT-value of its CT-marked response. For example, if English had visible CT marking in a question like (31a)[10], we would want its CT-value to be the same as that of the answer in (31b). This CT-value is given in (31c), where the $\stackrel{\star}{=}$ sign indicates that we would like the two values to be equal.

(31) a. And does [JOHN]$_{CT}$ run?

b. [JOHN]$_{CT}$ runs…

c. $[\![$ (31a) $]\!]^{ct} \stackrel{\star}{=} [\![$ (31b) $]\!]^{ct}$ = { {John runs}, {Mary runs}, {Fred runs} … }

10 I use an English example here only for ease of illustration, and make no claims as to the presence or meaning of CT in English questions.

As I indicated above, nothing prevents us from calculating the CT-value of a question. Here, I assume the existence of a polar question operator C_Q that takes a proposition to the singleton set containing that proposition—$[\![C_Q]\!]^o = \lambda p_{\langle s,t\rangle} . \{ p \}$. In this case, the CT-value of the hypothetical question in (31a) as derived via Büring's definition in (3) is given in (32), with the full calculation given in appendix A. However, the result is not the value we need to satisfy CT-congruence.

(32) $[\![C_Q [[\text{John}]_{CT} \text{ runs }]]\!]^{ct} = \{ \{\{\text{John runs}\}\}, \{\{\text{Mary runs}\}\}, \{\{\text{Fred runs}\}\}, \dots \}$

As it stands, this CT-value is unusable in Büring's theory. According to either Büring's original definition, or our modified definition of CT-congruence, a CT-marked utterance with the CT-value in (32) would require the discourse to contain a set of questions with denotations like {{John runs}} and {{Mary runs}}. However, these are not standard question denotations, so CT-congruence will never be satisfied.

There are several ways to go about fixing this technical problem. Perhaps the most direct approach is to modify our new congruence definition to work with these broken CT-values. Specifically, in the case of questions, instead of requiring co-strategic questions $[\![Q]\!]^o$ to be elements of $[\![U]\!]^{ct}$, we require these questions to be *elements of* elements of $[\![U]\!]^{ct}$, as in the last line of (33):

(33) CT-Congruence (**hypothetical version**, modified to work with broken CT-values)

An utterance U containing a contrastive topic can map onto a move M_U within a d-tree D only if U indicates a strategy around M_U in D.

U indicates a strategy around assertion M_U in D iff there is a non-singleton set Q′ of questions such that for each $Q \in Q'$ —

(i) Q is identical to or a sister of the question that immediately dominates M_U, and
(ii) $[\![Q]\!]^o \in [\![U]\!]^{ct}$

U indicates a strategy around question M_U in D iff there is a non-singleton set Q′ of questions such that for each $Q \in Q'$ —

(i) Q is identical to or a sister of M_U, and
(ii) $\mathbf{\exists \alpha [\alpha \in [\![U]\!]^{ct} \& [\![Q]\!]^o \in \alpha]}$

An alternative solution would be to stick with the ideal version of CT-congruence in (30), and redefine the $[\![\cdot]\!]^{ct}$ function so that questions have a "normal" CT-value. One way to accomplish this would be to make the question operator a special case that is simply ignored in the CT-value calculation:

(34) CT-Value (modified to work with polar questions)

$[\![A]\!]^{ct} =$

a. **if A = [C_Q B],** $[\![B]\!]^{ct}$
b. otherwise, $[\![A]\!]^{ct\text{-orig}}$

where $[\![\cdot]\!]^{ct\text{-orig}}$ follows Büring's original definition in (3)

This approach is appealing in that (a) CT-values remain recognizable as sets of standard questions, and (b) CT questions and their answers share the same CT-value. However, since (34) makes a special case of polar questions, this particular implementation won't extend to wh- questions, which can also be CT-marked, as we'll see shortly. Thus, I opt for a more general but less transparent version of this second solution; we modify $[\![\cdot]\!]^{ct}$ to detect question types and undo the extra layer of embedding introduced by Büring's (2003: 539) original definition in the case of questions as follows:

(35) CT-Value (**final version**, modified to work with questions in general)

$[\![A]\!]^{ct}$ =

a. **if** $[\![A]\!]^{o} \in \wp(D_{\langle s,t \rangle})$, $\quad \{ \alpha \mid \exists \beta [\alpha \in \beta \ \& \ \beta \in [\![A]\!]^{ct\text{-}orig} \}$

b. otherwise, $\quad [\![A]\!]^{ct\text{-}orig}$

where $\wp(D_{\langle s,t \rangle})$ is the set of all sets of propositions (i.e. the set of all questions), and $[\![\cdot]\!]^{ct\text{-}orig}$ follows Büring's original definition in (3).

Given the modifications in (30) and (35), Büring's theory extends to cover CT questions like those in Mandarin. For example, the follow-up question in (36), repeated from above, will have the CT-value shown below, and CT-congruence will correctly require the existence of a sister question of the form *You want to eat X* in the discourse.

(36) (nà) nǐ xiǎng bù xiǎng chī [SHUǏ-ZHǓ-YÚ]$_{CT}$ **ne**?
then you want not want eat water-boil-fish NE
'Then do you want to have *boiled fish* NE?'

$[\![$ (36) $]\!]^{ct}$ = { {You want hot pot}, {You want boiled fish}, {You want Peking duck}, … }

It is also relevant to ask why in (29) A's *initial* question of *Do you want to go out for hot pot tonight* fails to license *ne*, given the presence of the upcoming sister question. Nothing in the d-trees theory would formally prevent this type of CT marking. Intuitively, the problem is that speaker A would be marking the existence of a strategy (for example, of figuring out what B wants to go out to eat tonight) before the larger question that strategy addresses is a relevant issue in the discourse. Of course, this is not to say that CT is unable to raise an implicit question that was not previously salient, as we saw was possible in (15). Rather, the crucial requirement is that at the time of utterance, a speaker using CT must intend for the (potentially upcoming) discourse to satisfy CT-congruence. In the case of A's initial question in (29), the problem with using *ne* is simply that A has no intention of the discourse containing sister questions, whether implicit or explicit, preceding or upcoming.

The infelicity of *ne* on the first question in (29) is akin to the infelicity of narrow focus marking out of the blue in English (37a–d). For example, (37d) is bad because the speaker does not intend the discourse to contain any contrasting questions asking whether B wants to go out for hot pot at other times.

(37) Context: Calling a friend out of the blue.

a. ??Do YOU want to go out for hot pot tonight?
b. ??Do you WANT to go out for hot pot tonight?
c. ??Do you want to go OUT for hot pot tonight?
d. ??Do you want to go out for hot pot TONIGHT?
e. Do you want to go out for HOT POT tonight?

One interesting fact about the English example is that when the default stress pattern in (37e) is used, no contrasting question is required. If we leave *ne* out of the picture, the same holds of Mandarin questions, as in (38a–c), where only the default stress pattern in (38c) is possible out of the blue. However when *ne* is added, even (38c) is impossible. Since a question with *ne* requires a contrasting question within the CT-value, even the default stress pattern can only be interpreted as drawing a contrast.

(38) Context: Calling a friend out of the blue.

a. **??**NǏ xiǎng bù xiǎng jīntiān wǎnshàng chū-qù chī huǒguō (ne) ?
b. **??**nǐ xiǎng bù xiǎng JĪNTIĀN wǎnshàng chū-qù chī huǒguō (ne) ?
c. nǐ xiǎng bù xiǎng jīntiān wǎnshàng chū-qù chī HUǑGUŌ (**??ne**) ?
   you want not want today night out-go eat hotpot NE
   'Do you want to go out for hotpot tonight (??NE) ?'

These data further clarify that *ne* always marks contrast, and more specifically depends on a focused constituent within the sentence to carry that contrast.

I will not provide a full theory of CT-marking on wh- questions here, but I note that the discourse conditions on wh- questions with *ne* are parallel to those on *ne*-marked polar questions, and that our revised definition of CT-value in (35) can plausibly handle these cases, given a few assumptions about the structure of wh- questions. For the purposes of illustration, let's assume that wh- words are interpreted such that ⟦ [*dài shá*]$_{VP}$ 'bring what' ⟧^{o} = { bring fish, bring lamb, bring dumplings, … } and ⟦ [*zhāngsān dài shá*]$_{IP}$ 'Zhangsan bring what' ⟧^{o} = { Zhangsan brings fish, Zhangsan brings lamb, … }. In this case, the second wh- question in (39) will have the CT-value shown below. This result is derived directly from (35), via a modification to Büring's original CT-value for the question, which is given in (40), and derived in appendix A.

(39) A: lǐsì dài shá[11] le (**#ne**)?
Lisi bring what PRT NE
'What did Lisi bring (#NE)?'

B: lǐsì dài-le yú.
Lisi bring-ASP fish
'Lisi brought fish.'

A: nà [ZHĀNGSĀN]$_{CT}$ dài shá le **ne**?
then Zhangsan bring what PRT NE
'And what did *Zhangsan* bring NE?'

$$[\![(39A_2)]\!]^{ct} = \left\{ \begin{array}{l} \{ \text{Zhangsan brought fish, Zhangsan brought lamb, …} \} \\ \{ \text{Lisi brought fish, Lisi brought lamb, …} \} \\ \ldots \end{array} \right\}$$

(40) $[\![[\text{Zhangsan}]_{CT} [\text{ brought what }]]\!]^{ct\text{-}orig}$

$$= \left\{ \begin{array}{l} \{\{ \text{Zhangsan brought fish, Zhangsan brought lamb, …} \}\} \\ \{\{ \text{Lisi brought fish, Lisi brought lamb, …} \}\} \\ \ldots \end{array} \right\}$$

Up until now, we've focused on strategies made up of sub-questions that are parallel in structure, varying only in a fixed CT-marked position, and remaining otherwise constant. However, as we saw with assertions in section §2, the CT-marking in questions can also be broad, marking a proposition-denoting constituent. In this case, the sister questions are unrestricted in form, and can thus correspond to any salient question. This allows for examples like the following, where B's challenge is simply marked as one of a set of questions:

(41) A: I'm the smartest person in the world! I can answer any question!

B: nà [yī yì chéng-yǐ YĪ YÌ děngyú duō-shǎo]$_{CT}$ **ne**?
then one hundred.million times-by one hundred.million equal much-little NE
'Then what's 100,000,000 times 100,000,000 NE?'

$[\![(41B)]\!]^{ct} = \{ Q \mid Q \subseteq D_{\langle s,t \rangle} \}$

The larger prediction then, is that any Mandarin question with default prosody can be marked with CT *ne*, as long as the discourse contains some sister question within the same strategy. Generally, this prediction seems correct[12]. However, one seeming exception warrants further discussion, as it requires a refinement to the notion that a single d-tree can stand as the representation for an entire discourse.

11 Some informants report *ne* sounding marginally acceptable on out of the blue questions similar to this one, but having an affected quality that only a certain type of speaker would ever use. In this example, the rough-sounding colloquial variant *shá* 'what' has been used in the place of the standard Mandarin *shénme* 'what', as a way of ruling out the possibility of this affective use.

12 One striking exception to this generalization is questions with the Y/N particle *ma*, which can never take CT *ne*. I address this incompatibility elsewhere, as phonological in nature.

5. Putting Clarifications Aside

In (42), *ne* is illicit on B's question of clarification, despite the possibility of further "sub-questions" aimed at resolving the larger issue of why Lu Dahai is waiting, as shown in (43). How should we understand the failure of *ne* to mark this type of "sub-question"?

(42) A: zěnme lǔ dàhǎi hái zhèr děng-zhe yào jiàn nǐ ne?
'Why is Lu Dahai still waiting for you here?'

B: shéi shì lǔ dàhǎi (**??ne**) ?
'Who is Lu Dahai (??NE) ?' [Shi 1997: 134]

(43) Hypothetical d-tree for (42)

Question: Why is Lu Dahai still waiting for you here?

Sub-Question: Who is Lu Dahai?
Sub-Answer: Lu Dahai is the tax collector.

Sub-Question: Is it that I forgot to pay him?
Sub-Answer: […]

The defining feature of this example is that B's question does not actually address A's question, but rather seeks to clarify the content of the question itself. Thus, we can rule out CT in (42) by observing that B's question fails to meet Büring's condition in (44b) on a sub-question being a *relevant* to the immediate question under discussion:

(44) Relevance (Büring 2003: 517–518, 541)

A move M in D is relevant iff:

a. M is assertive and $[\![M]\!]^o$ answers the immediate IQUD at M in D, or
b. M is interrogative and at least one answer to $[\![M]\!]^o$ answers the IQUD at M in D.

where the *immediate question under discussion* (IQUD) is defined as the meaning of the immediately dominating node in the d-tree.

(45) Answer (Büring 2003: 517, 541)

A proposition p answers a set of propositions Q if p contextually entails a change in probabilistic weight for at least some $q \in Q$.

The remaining problem then, is understanding how the exchange in (42) is felicitous at all. Since relevance is a condition on d-tree formation in general, if we invoke relevance to rule out CT on B's response—as I believe we should—then we end up predicting that this discourse is impossible irrespective of CT marking. The problem is that there is nowhere to hang B's request for clarification in a d-tree that makes it formally relevant to any question under discussion. Consequently, I propose that B's request is the root of an independent d-tree, and that this secondary d-tree is associated with the main d-tree via a relation of "interruption". The circled numbers in the following pair of d-trees

illustrate the procession of moves in the discourse.

(46) d-trees for (42)

a. Primary d-tree:

① Question: Why is Lu Dahai still waiting for you here?

④ Sub-Question: Is it that I forgot to pay him?
⑤ Sub-Answer: […]

b. Secondary d-tree:

② Question: Who is Lu Dahai?
③ Answer: Lu Dahai is the tax collector.

Formally, we can define a discourse as containing not just one d-tree, but a set of d-trees, one of which is primary. Each non-primary d-tree *interrupts* a particular move in the discourse. For example, in the dialogue above, (46b) interrupts the initial move in (46a). To implement this idea, we need to modify Büring's definition of precedence to accommodate sequences of utterances mapping to moves in multiple trees. The technical details of these changes are provided in appendix B. Once these technicalities are in place, we can add a condition on well-formed discourses stating that all non-primary d-trees must *clarify* the move they interrupt[13], in the sense below.

(47) Clarification

A d-tree D_2 *clarifies* a move M in d-tree D_1 iff both

a. D_2 interrupts M, and
b. the root of D_2 is a question that was wrongly presumed by one of the participants to have been resolved by the common ground at M in D_1.

In summary, the mechanism of clarification gives us a way of letting B's question in (42) directly follow A's question, while still not counting as a sub-question, which would entail the possibility of CT marking.

6. Conclusions and Remaining Work

Associating *ne* with CT immediately raises a number of interesting questions, both about the particle itself, and about the theory of contrastive topic in general. We've seen that the appearance of *ne* on questions falls in with standard assertive uses of CT, with the common feature being that CT marks a strategy, and constrains the shape of that strategy. While CT assertions *answer* sub-questions of a strategy, CT questions *are* those sub-questions. This fundamental difference necessitated changes to the definitions of CT-congruence and CT-value.

13 There are no doubt other means of licensing interruptions that do not fall under the rubric of clarification. To take just one example, questions of pressing importance like *Oh my god, what's THAT??* should probably licensed as an interruption to almost any move. I do not address the constraints on these or other types of interruptions here.

With a theory that incorporates CT questions, we also gain a means of diagnosing whether a given question is formally standing as a sub-question or not—by probing whether it can take *ne*. This led to the discovery that questions of clarification, which might intuitively be treated as partial answers, cannot be CT-marked. This small discovery, in turn demanded a way of "hiding" these questions out of the way of the main discourse tree, and I defined a formal mechanism of interruption that can accomplish this.

One remaining question concerns the optionality of CT. Whereas Büring (2003: 526) claims that English CT is obligatory when answering implicit sub-questions, Mandarin CT *ne* is quite generally optional. This raises the question: What controls the differences between CT optionality across languages?

Appendix A: CT-Value Calculations using Büring's $[\![\cdot]\!]^{ct}$

(48) $[\![C_Q [[John]_{CT} runs]]\!]^{ct}$

$= \{ \beta \mid \exists b,c [\quad b \in [\![C_Q]\!]^{ct}$
$\quad \& \quad c \in [\![[John]_{CT} runs]\!]^{ct}$
$\quad \& \quad \beta = \{ \alpha \mid \exists b',c' [\quad b' \in b$
$\quad \& \quad c' \in c$
$\quad \& \quad \alpha = b' + c'] \}] \}$

$= \{ \beta \mid \exists b,c [\quad b \in \{\{ [\![C_Q]\!]^{o} \}\}$
$\quad \& \quad c \in \{ \{John runs\}, \{Mary runs\}, \{Fred runs\}, \dots \}$
$\quad \& \quad \beta = \{ \alpha \mid \exists b',c' [\quad b' \in b$
$\quad \& \quad c' \in c$
$\quad \& \quad \alpha = b' + c'] \}] \}$

$= \{ \beta \mid \exists c [\quad c \in \{ \{John runs\}, \{Mary runs\}, \{Fred runs\}, \dots \}$
$\quad \& \quad \beta = \{ \alpha \mid \exists b',c' [\quad b' \in \{ [\![C_Q]\!]^{o} \}$
$\quad \& \quad c' \in c$
$\quad \& \quad \alpha = b' + c'] \}] \}$

$= \{ \beta \mid \exists c [\quad c \in \{ \{John runs\}, \{Mary runs\}, \{Fred runs\}, \dots \}$
$\quad \& \quad \beta = \{ \alpha \mid \exists c' [\quad c' \in c$
$\quad \& \quad \alpha = [\![C_Q]\!]^{o} + c'] \}] \}$

$= \{ \{\{John runs\}\}, \{\{Mary runs\}\}, \{\{Fred runs\}\}, \dots \}$

(49) $[\![[Zhangsan]_{CT} [brings what]]\!]^{ct}$

$= \{ \beta \mid \exists b,c [\quad b \in [\![[Zhangsan]_{CT}]\!]^{ct}$
$\quad \& \quad c \in [\![brings what]\!]^{ct}$
$\quad \& \quad \beta = \{ \alpha \mid \exists b',c' [\quad b' \in b$
$\quad \& \quad c' \in c$
$\quad \& \quad \alpha = b' + c'] \}] \}$

$= \{ \beta \mid \exists b,c [\quad b \in \{ \{Zhangsan\}, \{Lisi\}, \{Wangwu\}, \dots \}$
$\quad \& \quad c \in \{\{\{ brings fish, brings lamb, brings dumplings, \dots \}\}\}$
$\quad \& \quad \beta = \{ \alpha \mid \exists b',c' [\quad b' \in b$
$\quad \& \quad c' \in c$
$\quad \& \quad \alpha = b' + c'] \}] \}$

$= \{ \beta \mid \exists b [\quad b \in \{ \{Zhangsan\}, \{Lisi\}, \{Wangwu\}, \dots \}$
$\quad \& \quad \beta = \{ \alpha \mid \exists b' [\quad b' \in b$
$\quad \& \quad \alpha = b' + \{ brings fish, brings lamb, \dots \}] \}] \}$

$$= \left\{ \begin{array}{l} \{\{ \text{Zhangsan brings fish, Zhangsan brings lamb, } \dots \quad \}\} \\ \{\{ \text{Lisi brings fish, Lisi brings lamb, Lisi brings dumplings, } \dots \}\} \\ \dots \end{array} \right\}$$

Appendix B: The Mechanism for Interruptions

(50) Assume that D∗ is the set of all well-formed discourses.

(51) Well-formed Discourse (Büring 2003: 539)

⟨ICG,D,EXPLICIT⟩ ∈ D∗ iff

a. ICG is a set of propositions (the initial common ground of the participants)
b. D is a tree
c. EXPLICIT is a function from nodes in D to {0, 1}
d. nodes in D, called moves, are syntactic phrase markers (without CT/F-marking)
e. all moves in D are Informative
f. all moves in D are Relevant
g. all moves in D meet the Minimality Condition

(52) Well-formed Discourse (revised to handle interruptions)

⟨ICG,D,EXPLICIT,**INTERRUPTS**⟩ ∈ D∗ iff

a. ICG is a set of propositions (the initial common ground of the participants)
b. D is a **set of trees, containing one primary tree D_1**
c. EXPLICIT is a function from nodes **in trees in D** to {0, 1}
d. **INTERRUPTS is a function from non-primary trees in D to moves in trees in D**
e. nodes **in trees in D**, called moves, are syntactic phrase markers (without CT/F-marking)
f. all moves **in trees in D** are Informative
g. all moves **in trees in D** are Relevant
h. all moves **in trees in D** meet the Minimality Condition
i. **all non-primary trees Clarify a move in some tree in D** (though see ff. 13)

(53) Clarification

A d-tree D_2 *clarifies* a move M in d-tree D_1 iff both

a. INTERRUPTS(D_2) = M, and
b. the root of D_2 is a question that was wrongly presumed by one of the participants to have been resolved by the common ground at M in D_1

(54) d-well-formedness (Büring 2003: 541)

A sequence $\langle U_0 , \ldots U_{max} \rangle$ of phrase markers including CT/F-marking is d-wellformed iff there is a d-tree D such that for each U_n, $0 \leq n \leq max$, U_n has a congruent map Map(U_n) among the moves in D, and for all m, if $m < n$, then Map(U_m) ∈ $PRED_D$(Map(U_n)).

(55) d-well-formedness (revised to handle interruptions)

A sequence $\langle U_0 , \ldots U_{max} \rangle$ of phrase markers including CT/F-marking is d-wellformed iff there is a **set of d-trees** D such that for each U_n, $0 \leq n \leq max$, U_n has a congruent map $Map(U_n)$ among the moves in **a d-tree in** D, and for all m, if $m < n$, then $Map(U_m) \in PRED_D (Map(U_n))$.

(56) Predecessor (Büring 2003: 540)

Let $PRED_D(M)$ be that function which assigns to any move M the smallest set of moves M′ such that

a. M′ precedes M in D
b. EXPLICIT(M′) = 1

Note: As it stands, $PRED_D(M)$ is not uniquely defined.

(57) Predecessor (corrected)

Let $PRED_D(M)$ be **the set of all moves M′** such that

a. M′ precedes M in D
b. EXPLICIT(M′) = 1

(58) Precedence (Büring 2003: 540)

M_1 precedes M_2 in d-tree D iff either

a. M_1 dominates M_2, or
b. there are Moves M_3 and M_4 which are sisters in D such that
    i. M_3 is to the left of M_4, and
    ii. M_3 dominates or equals M_1, and
    iii. M_4 dominates or equals M_2

(59) Precedence (revised to handle interruptions)

M_1 precedes M_2 in a set of d-trees D iff either

a. M_1 and M_2 are in the same d-tree and M_1 "precedes" M_2 by the definition in (58), or
b. M_1 is in d-tree D_i and INTERRUPTS(D_i) precedes M_2 in D
c. M_2 is in d-tree D_i and M_1 equals or precedes in D_i INTERRUPTS(M_2)

Note: Precedence is defined recursively so interruptions can be multiply embedded.

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