On the discourse dynamics of Exceptional *what*-Questions

Muyi Yang and Teruyuki Mizuno
University of Connecticut

1 Introduction

This study investigates what we call '*Exceptional what-Questions*' (*Ewh-Qs*), a cross-linguistically attested phenomenon in which *what* is used non-argumentally. In Japanese, for example, *nani-o* 'what-ACC' in (1) is not an argument of *mi* 'see', as the object is already saturated with another accusative-marked noun phrase *kocchi-o* 'here-ACC'. Similarly, *nani-o* does not function as an argument in (2) either, as *hasir* 'run' is an intransitive verb and does not take an object.

(1) *kimi-wa **nani-o** jirojiro kocchi-o mi-tei-ru no da?*
     you-TOP what-ACC suspiciously here-ACC see-PROG-NPST FIN COP
     lit. 'What are you looking at me?'

(2) *John-wa **nani-o** hasit-tei-ru no?*
     John-TOP what-ACC run-PROG-NPST FIN
     lit. 'What is John running?'   (Ochi and Hsin 1999: 2b)

The equivalent constructions have been reported in many languages across different language groups, such as Russian, Modern Greek, Chinese, German, Hebrew, Bulgarian, and Serbo-Croatian (Kurafuji 1996; Ochi and Hsin 1999).[1] For instance, in (3) and (4), both Chinese *shenme* and German *was* function as non-arguments, as the verbs used are intransitive and the subjects are occupied by *ni* and *du* 'you'.

(3) *bu jiushi laoshi lai le, ni pao **shenme**?*
     NEG just.be teacher come ASP you run what
     lit. 'It's just that the teacher has come. What are you running?'   (Mandarin)

(4) ***Was** schläfst du so lange?*
     what sleeps you so long
     lit. 'What are you sleeping for so long?'   (German, Ochi 2015: 15)

---

[1]While English does not seem to make productive use of non-argumental *what*, a similar observation can be made for a limited set of constructions. Ochi and Hsin (1999) observe that *care* can co-occur with *what*, although *care* by itself does not take a direct object.

(i) a. **What** do you *care* whether I cry or laugh?   (COCA)
     b. **What** do you *care* if I kill him or not?   (COCA)

While the interpretation of non-argumental *what* has usually been equated to that of *why*, previous works have also noticed that E*wh*-Qs cross-lingusitically come with special connotations which are not observed in *why*-questions. Here are a few quotes (emphasis is ours):

- 'The use of WHAT [= non-argumental *what*, (Y&M)] is most natural in contexts in which emotions such as annoyance, impatience, and surprises, and so on are expressed.' (Ochi 2015: 404)

- '... [our (2), (Y&M)] is best uttered in a situation in which the speaker is annoyed by John's running, or (s)he thinks that there is no need for John to run.' (Ochi and Hsin 1999: 315)

- '...sentences with Accusative *wh*-adjuncts have a special connotation that the speaker is surprised at, or is in disapproval of the animate subject's unexpected behavior' (Nakao and Obata 2009: 155)

While the description of interpretations slightly varies among authors, it seems to be at least a shared intuition that (i) E*wh*-Qs usually express surprise against someone's action, and (ii) the speaker is annoyed by, or disprefers, the action. As pointed out by the previous authors, such connotations are not obligatory in the corresponding *why*-questions. This implies that (i) and (ii) are rather conventional implications uniquely ascribed to the construction of E*wh*-Qs.

We are then led to an analytical issue: if the form-meaning link found in E*wh*-Qs is conventional, how does the association between the sentential form and the special interpretation arise? We argue that the previous accounts made by syntacticians have all ended up unsatisfactory. For instance, Ochi (1999) and Ochi and Hsin (1999) argued that the connotations of E*wh*-Qs are due to a strong focus on *what* which is, they argued, similar to '*the hell*' in '*wh the hell*' questions. However, it is not clear under their account how the speaker's surprise or dispreference is derived exactly from such strong focus. Nakao and Obata (2009) postulated a functional projection in the syntactic structure that uniquely encodes the meaning of E*wh*-Qs, but it is still questionable how theoretically explanatory it is to locate the complex interpretation of E*wh*-Qs at a single functional projection.

To approach a satisfactory account, this study addresses the issue from a formal semantic-pragmatic perspective, highlighting that the issue can be more effectively examined through looking at the behavior of E*wh*-Qs in discourse dynamics. Our account starts with tackling a descriptive challenge. While the meanings unique to E*wh*-Qs have been recurrently suggested in the literature, these reports have all stopped at a non-linguistic level. That is to say, the reported intuitions (see quotes above) about the presence of surprise/annoyance feelings are not evidenced by any linguistic data. We thus make it our starting point to flesh out the intuitions with concrete linguistic data, which will be the basis for the later formalization. In the theorizing part, one of the challenging issues, which we believe any other semantic work would also face, is how to resolve the tension at the semantics/pragmatics interface. E*wh*-Qs encode multi-faceted meanings, which could not be derived from one simplistic theoretical device. But if every single piece of meaning implied by E*wh*-Qs were taken care of solely in the compositional semantics, one could end up with an extraordinarily huge structure. Rather, we will argue that exploring the behavior of E*wh*-Qs in the discourse dynamics gives us a clue to factoring out what needs to be in the compositional semantics and what can be explained by pragmatic factors, thus rendering the semantic composition as minimal as possible. We will demarcate the division of labor between semantics and pragmatics,

and finally formalize the entire mechanism of E*wh*-Qs that includes the truth condition derived from the sentential form and the contextual requirements.

We propose that E*wh*-Qs are modalized questions whose answers lie in their own presuppositions. We show in §2 that E*wh*-Qs are not ordinary information-seeking questions. Once this has become clear, there then comes the question how exactly E*wh*-Qs are interpreted, and how to characterize the interpretation in a formal semantic/pragmatic framework. In §3, we look at the connotations behind E*wh*-Qs: intentionality, and the feeling of surprise and annoyance. Based on this, we motivate a modal account of E*wh*-Qs. In §4, we propose that postulating two covert elements (a modal and a desire predicate) and pragmatic presuppositions help derive the empirical data. In §5, we show how to derive the observed properties of E*wh*-Qs with our proposal. In §6, we propose the overarching discourse dynamics of the utterance of E*wh*-Qs.

Before moving on, it should be noted that the present study comes with an empirical limitation, since our formalization is built primarily based on the data obtained from Japanese E*wh*-Qs. While we suspect that the underlying interpretations of E*wh*-Qs are cross-lingusitically inert, we also acknowledge the possibility that detailed features may vary among languages. Thus, while this paper focuses on Japanese as the target language, it needs to be noted that the findings and generalizations obtained here may not cut across languages. We leave the research on cross-linguistic variation of syntactic, semantic and pragmatic properties of E*wh*-Qs for another occasion.

2 E*wh*-Qs as non-information-seeking questions

Despite taking on an interrogative form, native speakers point out that intuitively, E*wh*-Qs feel quite different from regular interrogatives in that they do not seem to require answers; in other word, E*wh*-Qs do not sound information-seeking. In this section, we aim at making this intuition concrete with three observations, and also speculate that E*wh*-Qs are similar to rhetorical questions (RQs) in this respect.

First, E*wh*-Qs are not compatible with a final rising intonation, which interrogative sentences in Japanese typically involve. From a functional point of view, Rieser (2017) points out that in general, falling and rising interrogatives differ in that the latter requests information from the addressee. In Japanese, for instance, canonical questions like *why*-questions can be construed as either information-seeking or non-information-seeking questions, as indicated by two possibilities of intonation in (5-a). E*wh*-Qs, however, only allows falling intonation, as in (5-b). Prosody thus provides the first piece of evidence that the speaker of E*wh*-Qs does not request information from the addressee.

(5)   a.   ***naze** yuka-de   ne-tei-ru*   *{no↑ / no↓ }?*
            why   floor-LOC sleep-PROG-NPST FIN
            'Why are you sleeping on the floor/'
   b.   ***nani-o**   yuka-de   ne-tei-ru*   *{?no↑ / no↓ }?*
            what-ACC floor-LOC sleep-PROG-NPST FIN
            lit. 'What are you sleeping on the floor?'

Second, the uttearance of a canonical question introduces the whole question as a discourse referent available for cross-sentential anaphora (cf. AnderBois et al. 2015 for declarative sentences). This is exemplified by (6), in which the pronoun *it* in B's utterance can be replaced by an embedded version of A's question.

(6) A: Why is he sleeping?
     B: I was wondering about <u>it</u> [=why he is sleeping], too!

E*wh*-Qs do not have such anaphoric potential as interrogatives, as illustrated by the oddness of *sore* 'that' in (7). Crucially, the predicate *siritai* 'want to know' is obligatorily interrogative-taking (e.g. **I want to know that John came*, cf. Lahiri 2002). Therefore, the predicate requires the pronoun *sore* to be construed as a question in the form of A's original question. The oddness of (7) as a reaction to (7) thus suggests that E*wh*-Qs do not allow such a construal.

(7) Context: Ann and Betty are talking about Carl, who is sleeping on the floor.

    A: *aitsu-wa*   ***nani-o***   *yuka-de ne-tei-ru*   *no?*
       that.guy-TOP what-ACC floor-LOC sleep-PROG-NPST FIN
       'Why/What is that guy sleeping on the floor?'
    B: ??*watasi-mo* <u>*sore*-o</u>   *siritakatta.*
       I-also   that-ACC wanted.to.know
       'I wanted to know it, too.'

   Finally, although utterances of E*wh*-Qs do not establish discourse referents in the way that information-seeking interrogatives do, they do introduce *propositional* discourse referents for future anaphora. This can be best tested with response particles (cf. Krifka 2013). As one would expect, canonical *wh*-questions cannot be answered with particles like *yes* or *no*, as illustrated in (8). However, E*wh*-Qs in (9)–(10) allow response particles like *un* 'yeah' or *hai* 'yes', and *iya* 'no'. Despite the presence of *what*, these examples suggest that E*wh*-Qs have declarative-like component in their meanings.

(8) A: Why are you sleeping on the floor?
     B: *Yes. / *No. / Because my bed broke.

(9) Same context as (7)

    A: *aitsu-wa*   ***nani-o***   *yuka-de ne-tei-ru*   *no?*
       that.guy-TOP what-ACC floor-LOC sleep-PROG-NPST FIN
       lit. 'What is that guy sleeping on the floor?'
    B: <u>*un,*</u> *yamete hoshii yone.*
       yeah stop   want SFP
       'Yeah, I want him to stop doing this.'

(10) Ann goes to Carl and ask:

    A: *kimi-wa*   ***nani-o***   *yuka-de ne-tei-ru*   *no?*
       that.guy-TOP what-ACC floor-LOC sleep-PROG-NPST FIN
       lit. 'What are you sleeping on the floor?'
    C: <u>*hai,* </u>*sumimasen. sugu oki-mas-u.*
       yes sorry   soon get.up-POL-NPST
       'You're right, I'm sorry. I'll get up now.'
    C': <u>*iya,*</u> *beddo-ga kowareta n   da   yo.*
       no bed-NOM broke   FIN COP SFP
       'No, my bed broke.'

Identifying E*wh*-Qs as non-information-seeking questions makes it natural to compare E*wh*-Qs with rhetorical questions (RQs). Bartels (1999), for instance, reports an intonational contrast between *wh*-RQs and their non-rethorical counterparts in English, in which the former tend to come with a falling intonation in the end, while the latter have the opposite tendency. Although the reason of the semantic-prosodic correlation deserves more careful consideration, the fact that falling intonation is required in Japanese E*wh*-Qs offers support for an analysis that treats them as RQs. E*wh*-Qs are also comparable to RQs from a semantic/pragmatic perspective. As will become clear in later sections, we propose an analysis where E*wh*-Qs share with RQs the (discourse-dynamic) property that both the speaker and the addressee know the answer, which gives rise to their property of non-information-seekingness. Yet, the difficulty with analyzing E*wh*-Qs is that their semantic content is not transparent. For RQs, there is no such problem because RQs and their non-rhetorical counterparts can be assumed to share the same denotation (e.g. Caponigro and Sprouse 2007). Therefore, in order to analyze E*wh*-Qs as RQs, one must first detect what is denoted by the sentential form of E*wh*-Qs.[2] Deferring the discussion of compositional semantics to §4, let us see some other empirical properties of E*wh*-Qs, which will help motivate our account.

3 Special connotations

3.1 Intentionality

We observe that the meaning of E*wh*-Qs involves the event agent's intentionality. Nakao and Obata (2009) use examples like (11) to show that E*wh*-Qs are subject to an animacy constraint.

(11) *ano {hito-wa / #booru-wa} nani-o   korogat-tei-ru no?*
      that person-TOP ball-TOP   what-ACC roll-PROG-NPST FIN
      lit. 'What is that person/ball rolling?'   (Nakao and Obata 2009: 155)

However, even with animate subjects, E*wh*-Qs can be infelicitous depending on the predicate type. For example, individual-level predicates like *kashikoi* 'smart' are not compatible with E*wh*-Qs.

(12) *#aitsu-wa   nani-o   kashikoi no?*
      that.guy-TOP what-ACC smart   FIN
      lit. 'What is he so smart?'

Also, events which do not involve agentive intentions, such as those described by unaccusative verbs like *shinu* 'die', are not comaptible with E*wh*-Qs.

(13) *#aitsu-wa   nani-o   shin-dei-ru   no?*
      that.guy-TOP what-ACC die-PROG-NPST FIN?
      lit. 'What did he die?'

We thus conclude that what E*wh*-Qs require is agentive intentionality, rather than animacy. In fact,

---

[2] As mentioned in §1, many previous studies compared Japanese E*wh*-Qs with *naze* 'why' questions, since the latter offers the closest translation of the interpretation of E*wh*-Qs (Kurafuji 1996, Ochi 1999, Nakao and Obata 2009 etc.). The examples in (5-a), (6) and (8) (the latter two being English examples, but can be carried over to *naze*-questions) show that this intuition is not reliable, i.e. E*wh*-Qs are not *why*-questions under a different guise. At this point, one could still argue that E*wh*-Qs are rhetorically-interpreted *why*-questions. However, as will be addressed again in footnote 3 in §3.1, this is also not the case.

(12) can be easily made felicitous if the predicate is replaced with *kashiko-buru* 'to pretend to be smart'.

(14) *aitsu-wa* *nani-o* <u>*kashiko-but*</u>-*tei-ru*   *no?*
   that.guy-TOP what-ACC smart-PRETENT-PROG-NPST FIN
   lit. 'What is he pretending to be smart?'

Also, native speakers report that (13) improves significantly if the sentence is uttered under a context where the speaker believes that the agent had died for a particular purpose, e.g. to make her suffer from the fear of having to live alone on purpose. These are all consistent with our argument.[3]

3.2 Speaker emotion: surprise and annoyance

As mentioned in §1, previous studies have pointed out the intuition that E*wh*-Qs come with speaker's emotions. We argue that the existence of these emotions can be confirmed by linguistic data. The presence of the emotion of surprise is shown by the incompatiblity of E*wh*-Qs with elements negating such emotions. In (15), such emotion is negated directly by a sentential conjunct.

(15) *boku-wa kimi-ga* *yuka-de* *neteite-mo odorok-anai kedo,* # *nani-o*   *yuka-de*
   I-TOP   you-NOM floor-LOC sleep-even surprise-NEG but   what-ACC floor-LOC
   ne-tei-ru   *no?*
   sleep-PROG-NPST FIN
   lit. 'I'm not surprised you're sleeping on the floor, but what are you sleeping on the floor?'

This is further supported by the fact that the use of E*wh*-Qs becomes infelicitous when elements that preempt the speaker's surprise are present. In (16), the adverb *itsumo* 'always' implies that the speaker habitually observes the event that the addressee sleeps on the floor.

(16) #*kimi-wa nani-o*   <u>*itsumo*</u> *yuka-de* *ne-tei-ru*   *no?*
   you-TOP what-ACC always floor-LOC sleep-PROG-NPST FIN
   lit. 'What are you always sleeping on the floor?'

We will argue that this obligatory occurrence of the speaker's surprise shares the same conceptual root as mirative expressions (Rett and Murray 2013). The formalization of the condition that induces the speaker's surprise will be discussed in §5.

   The presence of the emotion of annoyance can be shown in a similar way.

---

[3]This observation also provides another piece of evidence for the fact that E*wh*-Qs cannot simply be analyzed as *why*-questions, or even rhetorically-interpreted *why*-questions (cf. footnote 2). In the sentence below, the continuation about Taro's habit of cheating indicates that the question is intended as a rhetorical one. The E*wh*-Q variant of the question appears infelicitous, whereas the rhetorical *why*-question is acceptable (using the *wh*-phrase *naze* 'why' instead would make the sentence sound a bit odd for some reason that we do not understand).

(i)   To someone who pointed out that Taro is so smart that he gets full score in every exam...

   {*nande* / #*nani-o*} *aitsu-ga*   *kashikoi no? kanningu bakari shi-tei-ru*   *no-ga*   *yuumei da* *yo.*
   why   what-ACC that.guy-NOM smart   FIN cheating only   do-PROG-NPST NO-NOM famous COP SFP

   lit. 'Why/What is he so smart? He's famous for always cheating (so he's really not smart).'

(17) *yuka-de neru no-wa kamaw-anai kedo, # nani-o   yuka-de ne-tei-ru   no?*
      bed-LOC sleep NO-TOP mind-NEG but   what-ACC floor-LOC sleep-PROG-NPST FIN
      lit. 'I don't mind you sleeping on the floor, but what are you sleeping on the floor?'

Previous studies did not categorically tease apart the two types of emotions (see the quotes in §1). However, we find examples showing that E*wh*-Qs do not always come with the sense of annoyance. Assume that one does not find something interesting or funny if s/he is also annoyed by the same event. The E*wh*-Qs in (18) exhibit incompatibility with the continuation 'It's so funny', thus suggesting the presence of the sense of annoyance in the preceding E*wh*-Q. (19) show the opposite, i.e. E*wh*-Qs are compatible with the same continuation, thus indicating that the speaker is not being annoyed by the events.

(18) *aitsu-wa   nani-o   {yuka-de ne-tei-ru   / jirojiro   kocchi-o*
      that.guy-TOP what-ACC floor-LOC sleep-PROG-NPST   suspiciously here-ACC
      mi-tei-ru}   no? #omoshiroi ne.
      see-PROG-NPST FIN funny   SFP
      lit. 'What is he sleeping on the floor / sleeping on the floor? It's so funny.'

(19) *aitsu-wa   nani-o   {guruguru mawat-tei-ru   / asoko-no sora-o*
      that.guy-TOP what-ACC around   round-PROG-NPST   there-GEN sky-ACC
      mi-tei-ru}   no? omoshiroi ne.
      look-PROG-NPST FIN funny   SFP
      lit. 'What is he spinning around / looking at the sky? It's so funny.'

The intuition is that annoyance arises more easily if the described event is somehow 'relevant to the speaker'. Compared with the events 'spinning around' and 'looking at the sky' in (19), the events 'sleeping on the floor' or 'looking at me' in (18) occur more easily in a context where the speaker is also involved, e.g. the speaker shares the same space, or does not like being stared at by strangers etc. Consequently, E*wh*-Qs show different compatibility with the continuations in (18) and (19), although there are contexts to force the felicity of (18), and the infelicity for (19).

4 Proposal: the semantics-pragmatics of E*wh*-Qs

This section presents our core proposal of the semantics and pragmatics of E*wh*-Qs. The challenge with identifying the compositional semantics of E*wh*-Q is their opaque internal structure: despite the multi-faceted meanings they have, it is not clear on the surface which part of the structure of E*wh*-Qs map to which component of their meanings. We argue that all the observations that have been made so far can be derived by postulating two covert modal operators in the structure together with auxiliary contextual requirements. Specifically, we propose that E*wh*-Qs involve in their composition a **covert teleological necessity operator** and a **covert desire predicate**. Our proposal departs from previous works in that *what* is not assumed as an adjunct phrase equivalent to *why*. Rather, we analyze *what* in E*wh*-Qs as denoting a set of propositions whose trace is the **propositional argument** taken by the covert desire predicate. This assumption makes a natural fit with the existence of accusative case in Japanese E*wh*-Qs. Before the empirical justification for positing these modal operators, we first introduce the formal framework upon which our proposal will be built.

4.1 Composing E*wh*-Qs

Following the traditional view of modal logic and formal semantics, we assume that modal expressions like *must* and *can* are quantifiers over possible worlds. In this respect, the sentence '*must p*' can be roughly translated to having a universal quantifier over worlds, i.e. its truth is ensured iff p is true in all accessible worlds. Alternatively, the sentence '*can p*' is true iff p is true in some accessible world(s). On top of this, we assume the Kratzer-style semantics of graded modality (cf. Kratzer 1981, 1991). In a nutshell, a modal expression is evaluated against a modal base f and an ordering source g. Both f and g are functions from worlds to sets of propositions. The modal base f provides the relevant background information for the evaluation of the modal (what the facts are, what the speaker knows etc.). The ordering source g characterizes what are ideally the case based on certain contextually-determined criteria (what the laws say, what the goals are, what is normally the case etc.). What kind of flavor (epistemic, deontic, teleological, etc.) the modal represents is thus determined by the interplay between f and g. To this, we add another parameter α to f and g that specifies the holder of the relevant information. For instance, g_{teleo}^{α} is the function that maps a world w to α's goals at w (we will eliminate the agent parameter when agent is irrelevant or clear from the context). Importantly, an ordering source g at w induces a preorder $\leq_{g(w)}$ on worlds based on the extent to which each worlds makes true the propositions in $g(w)$.

(20) $v \leq_{g(w)} z$ iff $\{p : p \in g(w) \ \& \ z \in p\} \subseteq \{p : p \in g(w) \ \& \ v \in p\}$

Assuming the Limit Assumption (Lewis 1973), these parameters enable us to find a set of worlds that are maximally optimal in evaluating the modal, written as $O_{g(w)}(f(w))$.[4]

(21) $O_{g(w)}(f(w)) = \{v \in \bigcap f(w) : \neg \exists u \in \bigcap f(w)[u <_{g(w)} v]\}$

For examples, sentences like (22-a) is true if only if in all worlds where the relevant facts at w hold and your goals at w are maximally achieved, you get an MBA, as in (22-b).

(22)   a.   (In view of your goals,) you must get an MBA.
        b.   'You must get an MBA' is true relative to f_{circ} and g_{teleo}^{you} in w iff you get an MBA in all $w' \in O_{g_{teleo}^{you}(w)}(f_{circ}(w))$.

Turning to the desire predicate, Condoravdi and Lauer (2016) (and references cited therein) identify two different types of desire that the desire predicate *want* represents. The first type of *want* predicates 'mere desires', that is, the desires 'as a matter of psychological fact' (Hare 1968, cited in Condoravdi and Lauer 2016). Mere desires allow inconsistency since they are not relevant to the attitude holder's actions. However, *want* could also predicate the agent's preferences that will be taken into account when the agent chooses actions. The desires represented by this type of *want* are called *effective preferences* (henceforth EPs). Since a rational agent must resolve inconsistency while she has to decide among alternative courses of actions, EPs cannot be inconsistent. The two readings of *want* can be teased apart in the following example.

---

[4]$O_{g(w)}(f(w))$ is notationally equivalent to $O(f, g, w)$, the one conventionally adopted in the literature (see Kaufmann and Kaufmann 2015). The choice for the former is primarily for the sake of readability, especially when the modal base defined by f is further restricted by another proposition like in conditional sentences.

(23)   Q: Do you want to play tennis? (Levinson 2003, cited in Condoravdi and Lauer 2016: 22)

    a.   A: I want$_{MD}$ to, but I have to teach.

    b.   No [= I don't want$_{EP}$ to], I have to teach.

For concreteness, we adopt Condoravdi and Lauer's (2016) formalization of EP. Condoravdi and Lauer (2016) propose that the interpretation of the *want*$_{EP}$ is relative to a particular type of preference structure selected by the context. A preference structure represents a set of an agent's preferences and the importance ranking among them. An agent at a world can hold multiple preference structures.

(24)   **Preference structure** (Condoravdi and Lauer 2016: (65)):
    Given a set of worlds W, a preference structure is a pair $\langle \mathbf{P}, \prec \rangle$, where $\mathbf{P} \subseteq \mathcal{P}(W)$ and $\prec$ is a (strict) partial order on $\mathbf{P}$ (namely, $\prec$ is reflexive, antisymmetric and transitive).

Importantly, *want*$_{EP}$ is interpreted relative to an effective preference structure, i.e. a preference structure which requires that all inconsistent desires be asymmetrically ordered. We also assume with Condoravdi and Lauer (2016) that effective preference structures are realistic, namely all the desires must not be impossible desires. These notions are defined as follows.

(25)   **Consistency** (Condoravdi and Lauer 2016: (66)):
    A preference structure $\langle \mathbf{P}, \prec \rangle$ is *consistent* with respect to an information state B iff for any $X \subseteq \mathbf{P}$, if $B \cap \bigcap X = \emptyset$, there are $p, q \in X$ such that $p \prec q$.

(26)   **Realism** (Condoravdi and Lauer 2016: (67)):
    A preference structure $\langle \mathbf{P}, \prec \rangle$ is *realistic*, relative to an information state B, iff for all $p \in \mathbf{P} : p \cap B \neq \emptyset$.

In interpreting *want*$_{EP}$, the context supplies a function π that maps a world w and an agent a to a's effective preference structure $\pi(a, w)$ at w.[5] *Want*$_{EP}$ checks whether its propositional argument is among the top-ranked preferences in $\pi(a, w)$:

(27)   Semantics of *want*$_{EP}$:

    a.   *want*$_{EP}(a, \phi)$ is true in w iff $[\![\phi]\!] \in \mathbf{max}[\pi(a, w)]$ and $\pi(a, w)$ is consistent.

    b. $\mathbf{max}[\langle \mathbf{P}, \prec \rangle] := \{p \in \mathbf{P} | \neg \exists p \in \mathbf{P} : p \prec q\}$ (Condoravdi and Lauer 2016: 30)

The importance of *want*$_{EP}$ is that the EPs that it targets can constitute the goals or intentions for which the agent chooses actions among the alternatives, which can feed into the ordering source of the teleologically construed necessity modal. In other words, *want*$_{EP}$ supplies the relevant goals that are needed for interpreting the teleological modal, whose ordering source is characterized as the following:

(28) $g^a_{teleo}(w) = \mathbf{max}[\pi(a, w)]$, where $\pi(a, w)$ is consistent with a's beliefs.

We argue that E*wh*-Qs contain a teleologically construed necessity modal operator and an EP-targeting desire predicate *want*$_{EP}$, the latter taking *nani-o* (more technically, its trace) as an argu-

---

[5]Condoravdi and Lauer (2016) makes π flexible enough to apply to both consistent and inconsistent preference structures. As our interest lies in the effective preference interpretation, we simply assume the preference structures mapped by π to all be consistent.

ment. The necessity modal and the desire predicate are linked in a way such that the ordering source with which the former is evaluated is determined by the latter, just as defined in (28). Having two covert elements in a poorly understood construction may seem unreliable at the first sight, but we think that this is exactly what E*wh*-Qs require. In the above, we have argued that E*wh*-Qs require intentionality (rather than just animacy). This can be well captured by the interplay between *want*_EP and the teleological necessity modal, with which the described events are restricted to those occurring based on an agent's action-relevant intentions. Note that merely having a teleological necessity modal would not be sufficient, since teleologically construed modals allow inanimate subjects, e.g. (29). Such an account would thus incorrectly predict E*wh*-Qs to be compatible with inaminate subjects as long as the context provides appropriate background information about the agent's goals. Adding *want*_EP requires the subject to be an intention holder, thus ensuring animacy.

(29) In view of your goal of making coffee on the top of the Everest, the water must be boiling at 100 degree.

Alternatively, having only *want*_EP is also insufficient, since, under its semantics defined in (27-a), *want*_EP by itself could not relate its propositional argument to the event described by E*wh*-Qs.

   Therefore, having both *want*_EP and the necessity teleological modal strikes us as the only plausible solution. We propose that *nani-o* 'what-ACC' denotes a set of propositions consistent with the modal's modal base, and *want*_EP picks out its propositional argument from the set denoted by *nani-o*. To illustrate the full compositional semantics, consider the following sentence.

(30) *kimi-wa nani-o   yuka-de ne-tei-ru   no?*
      you-TOP what-ACC floor-LOC sleep-PROG-NPST FIN
      lit. 'What are you sleeping on the floor?'

The precise derivation of (30) is laid out in Figure 1. We assume that the propositional *what* leaves a trace of type $\langle s,t \rangle$ and moves up to the top of the structure. The covert desire predicate WANT_EP takes the trace as its propositional argument and PRO as its subject. We assume that the subject PRO is to be controlled (i.e. identified with co-index) by the matrix subject. *want*_EP saturated with its argument functions as the restrictor of the covert teleological necessity modal whose agent is also controlled by the matrix subject. The covert modal then takes the matrix clause as its prejacent ('**s-o-f-t**' in Figure 1 stands for 'sleep on the floor'). The moved *what* and the rest are linked via Predicate Abstraction (Heim and Kratzer 1998). As an upshot, (30) denotes the semantics as in (31). As the paraphrase suggests, a E*wh*-Q is a question that asks for an agent's effective preference that necessitates the described event.

(31) $[\![(30)]\!]^{w,f,g,\pi} = \lambda p : p \cap \bigcap f_{circ}(w) \neq \emptyset.$
      $\forall w' : w' \in O_{g_{teleo}(w)}^{\text{PRO}_i}(f_{circ}(w) \cup \{\lambda w.p \in \mathbf{max}[\pi(\text{PRO}_i, w)]\}).$
      $[\text{sleep-on-the-floor}(\text{you}_i)(w')]$
      Paraphrase: 'What is the p in your top-ranked preferences such that it is necessary for you to be sleeping on the floor?'

4.2 Presuppositions of E*wh*-Qs

We argue that E*wh*-Qs also come with a series of pragmatic presuppositions, i.e. propositions that the speaker takes to be the mutual beliefs of the conversation participants (cf. Stalnaker 1978,

$$\lambda p : p \cap \bigcap f_{circ}(w) \neq \emptyset. \forall w' : w' \in O_{g^{\text{PRO}_i}_{teleo}(w)}(f_{circ}(w)$$
$$\cup \{\lambda w.p \in \mathbf{max}[\pi(\text{PRO}_i, w)]\}).\mathbf{s\text{-}o\text{-}t\text{-}f}(\text{you}_i)(w')$$

nani-o$_{\langle\langle s,t\rangle,t\rangle}$

$\lambda p.p \cap \bigcap f_{circ}(w) \neq \emptyset$

$$\lambda p.\forall w' : w' \in O_{g^{\text{PRO}_i}_{teleo}(w)}(f_{circ}(w)$$
$$\cup \{\lambda w.p \in \mathbf{max}[\pi(\text{PRO}_i, w)]\}).$$
$$\mathbf{s\text{-}o\text{-}t\text{-}f}(\text{you}_i)(w')$$

1

$$\forall w' : w' \in O_{g^{\text{PRO}_i}_{teleo}(w)}(f_{circ}(w)$$
$$\cup \{\lambda w.h(1) \in \mathbf{max}[\pi(\text{PRO}_i, w)]\}).$$
$$\mathbf{s\text{-}o\text{-}t\text{-}f}(\text{you}_i)(w')$$

$$\lambda q.\forall w' : w' \in O_{g^{\text{PRO}_i}_{teleo}(w)}(f_{circ}(w)$$
$$\cup \{\lambda w.h(1) \in \mathbf{max}[\pi(\text{PRO}_i, w)]\}).q(w')$$

$\lambda w.\mathbf{s\text{-}o\text{-}t\text{-}f}(\text{you}_i)(w)$

you$_i$ VP

$\lambda x \lambda w.\mathbf{s\text{-}o\text{-}t\text{-}f}(x)(w)$

$MUST^{\text{PRO}_i}_{f_{circ},g_{teleo}}$

$\lambda w.h(1) \in \mathbf{max}[\pi(\text{PRO}_i, w)]$

$$\lambda p \lambda q.$$
$$\forall w' : w' \in O_{g^{\text{PRO}_i}_{teleo}(w)}(f_{circ}(w)$$
$$\cup \{p\}).q(w')$$

PRO$_i$

$$\lambda x \lambda w.$$
$$h(1) \in \mathbf{max}[\pi(x, w)]$$

$t_{\langle s,t\rangle}$ WANT$_{\text{EP}}$

$h(1)$

$$\lambda p \lambda x \lambda w.$$
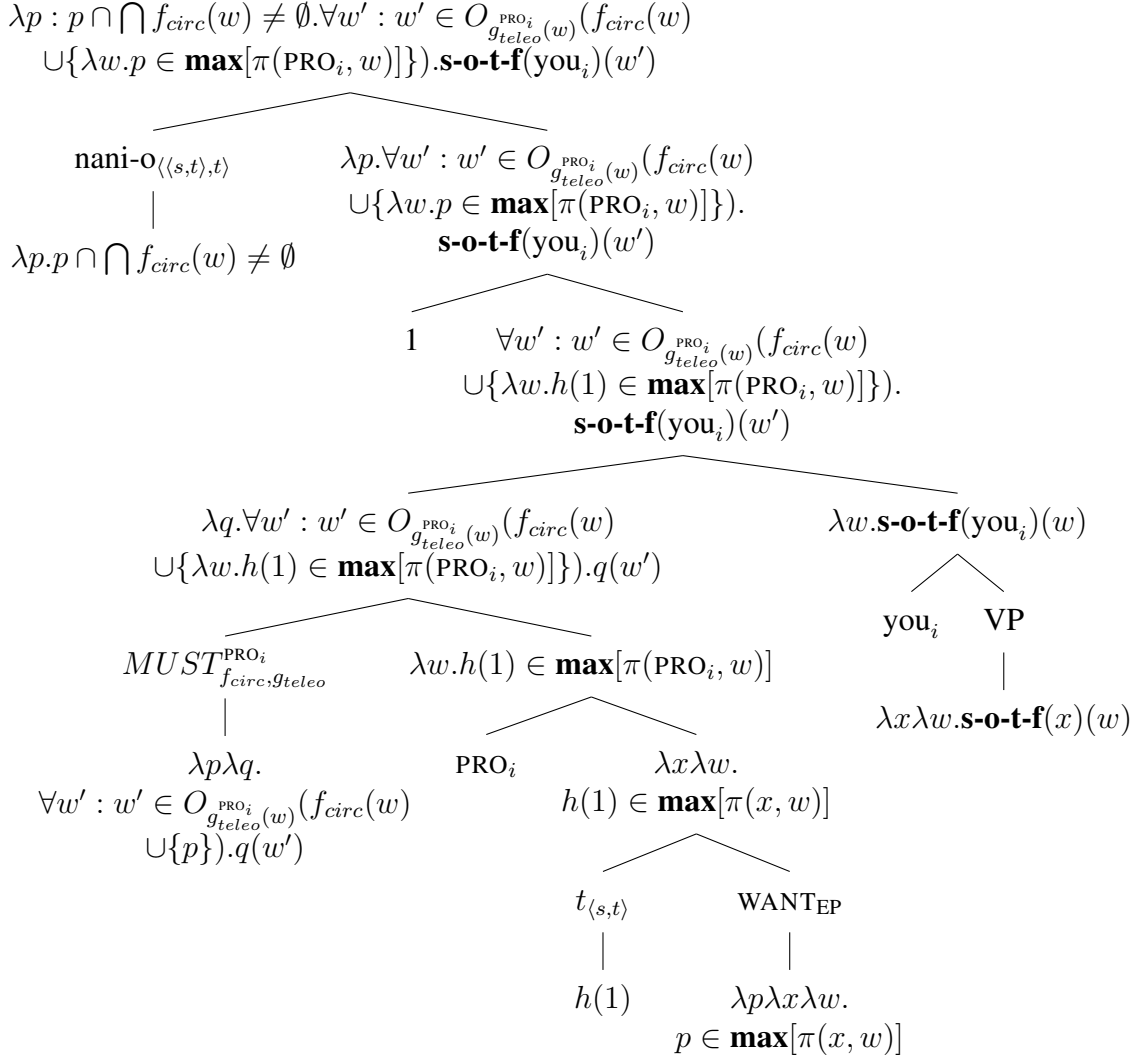$$p \in \mathbf{max}[\pi(x, w)]$$

Figure 1: The derivation of (30)

these are thus distinct from semantic presuppositions that determine definedness condition). We adopt the background notions from Stalnaker (1978). First, a proposition p is **common ground** at w iff all conversation participants believe p, i.e. p is mutual knowledge. A speaker a **s(peaker)-presupposes** p iff a believes that all conversation participants believe p. A context c is **non-defective** iff all conversations participants hold the same presuppositions. Assuming cooperativity, all participants make adjustments of their presuppositions once it becomes clear that c is defective, otherwise discrepancies in presuppositions may lead to a failure of communication. The defectiveness of a context will play a crucial role in the formulation of discourse dynamics in §6.

We propose that the speaker of E*wh*-Qs believes that she has perfect knowledge of the agent's action-relevant goals, and that other conversation participants are aware of her having perfect knowledge of that.[6] For instance, in the case where the salient agent is the addressee Ad (i.e.

---

[6]For simplicity, we only discuss examples with second-person subjects (i.e. the agent is the addressee) in this study. Our proposal is capable of dealing with examples with non-second-person subjects, with a bit more complications.

E*wh*-Qs with second-person subjects like (30)), the speaker Sp believes what Sp takes to be Ad's goals at w be identical with what Ad takes to be Ad's goals at w, and identical with Ad's belief about what Sp takes to be Ad's goals at w etc. We characterize this using the condition of Epistemic Authority (Kaufmann 2016): The speaker of E*wh*-Qs s-presupposes Epistemic Authority, defined as in (32). We also assume that for teleological modals, all rational agents are their own epistemic authorities, i.e. they have perfect knowledge of their own goals.

(32)   **Epistemic Authority** (Kaufmann 2016: (46)):
       Sp is an epistemic authority in c iff Sp has perfect knowledge of the modality character-ized by f and g at all w such that $w \in \bigcap cg$ (where cg is the set of propositions in the common ground).[7]

Epistemic Authority was originally implemented in Kaufmann (2016) to capture the interpretation of performative modal verbs and imperatives. The idea is that their interpretations (e.g. as opposed to the descriptive interpretation of modal verbs) arise only when the speaker enjoys a special epistemic status of knowing the relevant modal flavor. For example, when using utterances that give commands, the speaker can be considered to be in possession of perfect knowledge of the relevant rules or obligations that the agent complies with. In the case of E*wh*-Qs, Epistemic Authority means that the speaker has perfect knowledge of the relevant circumstances (due to f_{circ}) and the relevant goals of the agent (due to g^a_{teleo}). Note that this condition does not impose any restriction on what the non-speaker conversation participants (including Ad) actually know about the relevant modal flavors. Therefore, there may be cases where Sp's knowledge about Ad's goals agree with what Ad himself takes to be his own goals. For instance, (30) could be uttered in a context where Sp believes that what she takes to be Ad's goals is also what Ad actually takes to be his own goals. But there also may well be cases where participants' knowledge of Ad's goals does not match Ad's actual goals, e.g. Sp enjoys special privilege of *changing* Ad's goals. This can be exemplified by the following context, where E*wh*-Q is indeed felicitous.

(33)   Context: The tiger mother decides that her son's life-time goal is to become a pianist, and has been taking him to piano lessons for years. One day, she changes her mind and decides that her son's goal be a base ball player instead. Before she is able to tell him this decision, he starts to practice the piano as always.

       nani-o   piano-o   renshuu shi-tei-ru   no?
       what-ACC piano-ACC practice do-PROG-NPST FIN

       lit. 'What are you practicing the piano?'

On the other hand, when a context does not satisfy the s-presupposition of Epistemic Authority, E*wh*-Qs are predicted to be infelicitous, as in (34).

(34)   Context: Mary and John both want to make delicious curry for tonight's dinner. Mary

---

[7]We omit temporal parameter for simplicity. Also, we adopt the definition of perfect knowledge in Kaufmann (2016) (her (45)):

(i)   An individual a has perfect knowledge of a modality characterized by a modal base f and an ordring source g at a point of evaluation i iff for all p, $\Box^{f,g}p$ at $i \Leftrightarrow \Box^{R^e_a}\Box^{f,g}p$ at i (where R^e_a defines the worlds that are epistemically accessible for a).

looks at the recipe and starts cooking, and John is helping her. After Mary has added some ketchup to the pot, John looked at the recipe again and realized that they needed canned tomatoes, instead of ketchup.

> \# *nani-o   kecchappu-o ire-tei-ru   no?*
>   what-ACC ketchup-ACC add-PROG-NPST FIN

> lit. 'What are you adding ketchup?'

In addition, we argue that the speaker of E*wh*-Qs s-presupposes **Complement as Necessity**, e.g. for a E*wh*-Q in the form of '*nani-o p?*', the speaker s-presupposes $MUST_{teleo}^{Ad}\neg p$. The existence of this s-presupposition is confirmed by the fact that E*wh*-Qs cannot be conjoined with a sentence representing $CAN_{teleo}^{Ad}p$ (assuming that the two modals share the same set of goals). Note that the flavor of the prioritizing possibility modal *-temo ii* in the first sentence in (35) is fixed to a teleological one by the adverbial phrase 'in view of your diet'.[8] Note also that the protein that Sp refers to by the two occurrences of *kono purotein* 'this protein' is assumed to be identical.

(35) *daietto-no tameni kono purotein-o   non-demo   ii   kedo, \# nani-o   kono*
      diet-GEN   for   this protein-ACC drink-CONC good but,   what-ACC this

      purotein-o   non-dei-ru   no?
      protein-ACC drink-PROG-NPST FIN
      'You can drink this protein in view of your diet, but what are you drinking this protein?'

The presence of the s-presupposition of $MUST_{teleo}^{Ad}\neg p$ can also be shown by (36), where the context construes the proposition 'you drink protein B' as a possibility, which is also known to the speaker (i.e. the trainer).[9]

(36) Context: John starts weight training at the gym. He has poor knowledge about muscular fitness, so listens to whatever his trainer says. The gym offers two types of proteins, both having their own merits. Protein A tastes good, but is also expensive; protein B tastes horrible, but is much cheaper. The trainer lets John choose the one he likes. One day, the trainer sees John drinking Protein B:

---

[8]When the flavor of CAN is designated as deontic, the use of E*wh*-Q does not cause the same clash as found in (35), as shown by the following example.

(i)   *hooritsu-jou-wa kono purotein-o   non-demo   ii   kedo, nani-o   kono purotein-o   nondeiru no?*
       law-on-TOP   this protein-ACC drink-CONC good but,   what-ACC this protein-ACC drinking FIN
       'You can drink this protein in view of laws, but what are you drinking this protein?'

[9]We leave it for future research why such presupposition may arise from the utterance of E*wh*-Qs. However, we would like to point out that the presence of negation in the interpretation of a non-negated utterance should not be so surprising once we consider the rhetorical-like property of E*wh*-Qs. Rhetorical questions also tend to be interpreted as asserting the negative answer or the empty-set-denoting answer of the question (cf. Han 2002).

(i)   a.   After all, who helped Mary?   (Han 2002: 204)
            Interpretation: No one helped Mary.
       b.   Did John lift a finger to help Sam?   (Han 2002: 204)
            Interpretation: John did not lift a finger to help Sam.

See Han (2002) for an analysis that derives the negative-answer-denoting tendency using the Gricean maxim of quantity, but also see Caponigro and Sprouse (2007) for cases where such tendency does not hold.

> # *nani-o   purotein-B-o   non-dei-ru   no?*
>   what-ACC protein-B-ACC drink-PROG-NPST FIN
>
>   lit. 'What are you drinking Protein B?'

Putting the denotations and the s-presuppositions together, the sentence (30) thus has the following interpretation.

(37) *kimi-wa nani-o   yuka-de ne-tei-ru   no?*
       you-TOP what-ACC floor-LOC sleep-PROG-NPST FIN
       lit. 'What are you sleeping on the floor?'   (Repeated from (30))

    a. Denotes: 'What is the p in your top-ranked preferences such that it is necessary for you to be sleeping on the floor?'

    b. Speaker s-presupposes:

        (i) Speaker is an epistmeic authority in c;

        (ii) $MUST^{Ad}_{teleo}\neg$**sleep-on-the-floor**

5 Consequences, extensions and predictions

5.1 Non-information-seekingness

In §2, we pointed out the resemblance between E*wh*-Qs and RQs. Here we show that E*wh*-Qs, with the denotation and presuppositions defined above, can be analyzed in the same vein as RQs.

In Caponigro and Sprouse's (2007) analysis, RQs are endowed with the same denotation as ordinary questions. The only difference between RQs and ordinary info-seeking questions is their contextual requirement. According to Caponigro and Sprouse, ordinary info-seeking questions presuppose that the speaker is uncertain of the answer. Ordinary info-seeking questions are thus regarded as requests for answers (with the additional presupposition that the speaker thinks the addressee knows the answer). In contrast, Caponigro and Sprouse propose that RQs presuppose that the speaker and the addressee both know the answer of the question, namely that the answer is entailed by the common ground.

Now the denotation of '*nani-o p?*' proposed in (31) defines a set of propositions in the addressee's top-ranked preferences that necessitate the described event p. In order for this to be a RQ, it must be that the speaker presupposes that one of the propositions in the set denoted by E*wh*-Qs is already in the common ground. Crucially, the s-presupposition of Complement as Necessity entails that the negative complement (i.e. 'no goal necessitates p') is always presupposed to be in the common ground. The reasoning goes as follows. Given the current setting of teleological modality, it is a logical truth that $MUST^{Ad}_{teleo}\neg p$ entails that no goal of Ad's necessitates p. This can be shown by the following model. Assume that $g^{Ad}_{teleo}(w) = \{$Goal 1, Goal 2$\}$, and Goal 1 and Goal 2 are compatible with each other (i.e. $[\![$Goal 1$]\!] \cap [\![$Goal 2$]\!] \neq \emptyset$). Given that the two goals are compatible with each other, the optimal worlds $O(f_{circ}, g^{Ad}_{teleo}, w)$ must be in their intersection. Here, given the semantics of necessity, $MUST^{Ad}_{teleo}\neg p$ is true at w iff $O(f_{circ}, g^{Ad}_{teleo}, w) \subseteq [\![\neg p]\!]$, and this is also equivalent to saying that $O(f_{circ}, g^{Ad}_{teleo}, w) \cap [\![p]\!] = \emptyset$. Then it follows that no goal in $g^{Ad}_{teleo}(w)$ is a subset of p, since by monotonicity not including the intersection of Goal 1 and 2 entails including neither Goal 1 nor 2, and being disjoint to the intersection sufficiently entails this. Therefore $MUST^{Ad}_{teleo}\neg p$ entails that no goal necessitates (i.e. no goal is included by) p.

Then, by the s-presupposition of Complement as Necessity, the speaker believes that it is common ground that $MUST_{teleo}^{Ad}\neg p$. Jointly with the entailment shown above, it follows that the speaker believes that it is common ground that no goal of the addressee's necessitates p. This gives rise to the RQ-like property of E*wh*-Qs: since the answer is presupposed to be shared by participants in the common ground, E*wh*-Qs are not information-seeking. Importantly, as long as we assume the s-presupposition of Complement as Necessity, this non-info-seekingness always follows, since this presupposition logically entails the answer of the question. This means that E*wh*-Qs are obligatory RQs.

5.2 Surprise

The truth conditions and presuppositions proposed in §4 conspire to show that in the utterance of '*nani-o p?*', the speaker believes that the participants all share a dispreference of p over $\neg p$, and tries to reconfirm this via the utterance of RQs. Still, the use of E*wh*-Qs is hard-wired in the discourse dynamics in that it must be taken as a strong reaction against the actual action p. As shown in §3.2, the feeling of surprise necessarily accompanies the utterance of E*wh*-Qs, e.g. they cannot be uttered if the action in question occurs habitually, as shown by (16). However, the current denotation and presuppositions do not fully capture this fact, as they just characterize the relations between the speaker and addressee and their modal attitudes. We thus need to add an auxiliary condition which derives the speaker's feeling of surprise.

As the recent semantic study of mirative expressions has highlighted (e.g. Rett and Murray 2013), the key conceptual factors to the linguistic expressions of surprise relate to (i) unexpectedness and (ii) temporal closeness between the learning time and the utterance time. We speculate that E*wh*-Qs also require these two conditions. The former is already captured in our proposal, as the act of p goes against the speaker's expectation that p must not happen (the s-presupposition of Complement as Necessity). (ii) still eludes the proposal, and thus we need to add a condition that requires temporal recency between the utterance time of '*nani-o p?*' and the time of discovering p. Though defined somewhat casually, the following condition captures the desired requirement.[10]

(38)   **The Condition of Learning Time Recency**:
       The utterance time of '*nani-o p?*' must be as close to the (first) discovery time of p as possible.

It must be noted that (38) is not assumed as a s-presupposition like Epistemic Authority or Complement as Necessity. This is rather a condition on observations made by the speaker, namely one

---

[10]The data of Japanese '*nani-o p?*' presented in this study have all included the progressive aspect and non-past tense. While there is a stable tendency that '*nani-o p?*' comes with this 'progressive and non-past' combination, the non-past tense can be replaced by the past tense as long as the closeness of the learning time and the utterance time is satisfied, as shown by the following example (we thank Mitcho Erlewine for pointing this out).

(i)   John promised to Mom that he would finish his homework before she came home, but, absorbed in the TV game, he didn't even touch any part of the homework. When Mom came back, alas, John lied to her that he had finished everything, in fear of being scolded. Mom first believed his son's words, but later she somehow found the untouched homework. She then comes to his son and says:

       *Anta **nani-o**   uso-o   tui-tei-<u>ta</u>   no?*
       you   what-ACC lie-ACC tell-PROG-PAST FIN
       'What were you telling me a lie?'

that requires that the observation of p not be temporally remote from the utterance of E*wh*-Q. This thus needs to be satisfied independently of the state of common ground.

5.3 Annoyance

The seeming optional presence of annoyance connotation in the utterance of E*wh*-Qs also turns out unsurprising under our proposal. Recall that in (18)–(19), we observed that annoyance is not obligatory, and arises more easily if the described event is somehow 'relevant to the speaker'.

We speculate that the correlation between 'relevance to the speaker' and annoyance connotation is just a consequence of the pragmatic presuppositions of E*wh*-Qs. In §4.1, we argued that the necessity modal in E*wh*-Qs is evaluated against a teleological ordering source which represents the *salient agent*'s action-relevant goals in the context. Independent of the evaluation of the utterance, the speaker also has her own set of goals in the context, which may or may not match those of the agent's. The reasons that could lead to a (mis)match in conversation participants' goals include Questions Under Discussion (e.g. whether issues regarding joint goals are under discussion) and the types of the described events. For example, events like 'he is sleeping on the floor' and 'he keeps looking at me' in (18) are more easily construed (although not necessarily) in contexts where the agent's goals are also mutual joint goals, e.g. they share the same space of the dorm room, they are in a social relationship that requires appropriate behaviors. On the contrary, events like 'he is spinning around' and 'he is looking at the sky' tend to occur independently of other individuals, which means that they are more easily construed in contexts where the speaker and the agent each holds a distinct set of goals.

As discussed in §5.1, the s-presupposition of Complement as Necessity suggests that in view of the agent's action-relevant goals, $\neg p$ is a necessity. In cases where the agent's goals are shared by other conversation participants (including the speaker), this also means that $\neg p$ is a necessity in view of their action-relevant goals. Yet, this conflicts with the observed occurrence of p when E*wh*-Qs are uttered. This thus leads to the speaker's feeling of annoyance, i.e. the observed event prevents the achievement of her goals. On the contrary, if agent's goals are not shared, such connotation does not arise.

6 The dynamics of E*wh*-Qs in discourse

We finally show how all the ingredients presented so far are put together under the flow of discourse. The notion that plays a key role here is the defectiveness of the context as defined in §4.2. The use of E*wh*-Qs signals that the speaker has come to believe that the context is defective. This is due to the conflict that she finds between her presuppositions and that of the action agent. Assume that the current context involves only the speaker Sp and the addressee Ad as participants, and Ad is the action-taker here. Suppose that Sp s-presupposes (i.e. believes that both Sp and Ad believe that) $MUST_{teleo}^{Ad} \neg p$, but Sp nevertheless observes Ad's current performance of p. We assume that Ad is a rational agent, and all actions by rational agents are backed up by their goals. With this assumption, Sp would also believe that Ad had undertaken p due to $MUST_{teleo}^{Ad} \, p$ or $CAN_{teleo}^{Ad} \, p$. Therefore, Sp ends up s-presupposing $MUST_{teleo}^{Ad} \neg p$, while believing that Ad believes that $MUST_{teleo}^{Ad} \, p$ or $CAN_{teleo}^{Ad} \, p$. As a result, Sp notices that the context is defective: Sp finds a divergence between Sp's and Ad's beliefs about Ad's action-relevant goals. Noticing the defectiveness of context motivates Sp's utterance of E*wh*-Q. The use of a E*wh*-Q signals to the

other participant that the common ground is in crisis, and that they should adjust their common ground to regain the non-defectiveness of the context.

As a cooperative participant, Ad is required to help reach a non-defective context by responding to Sp's use of a E*wh*-Q. We speculate that there are two ways to reach a future non-defective context: (i) Ad modifies the discrepancy in the common ground about Ad's goals by justifying his performance of p, or (ii) Ad maintains Sp's s-presuppositions about Ad's goals by performing or promising $\neg p$. The former type of responses can be realized in various manners. Ad can respond by informing Sp of a novel circumstantial fact that Sp is not aware of, as in (39-A). In this case, Ad signals that the broken bed has caused a change to the goals constituting his teleological modality, which has led him to be sleeping on the floor (despite his original preference for the opposite). Ad can also respond by suggesting that there are preferences unknown to Sp, as in (39-A'). For instance, assume that everybody is required not to sleep on the floor in view of public health, but sleeping on bed is not comfortable in summer. In responding to Sp's use of a E*wh*-Q, Ad suggests that his goal of sleeping comfortably overrides the mutual goals (i.e. Ad has selected a different preference structure to determine his actions). Ad can also directly inform Sp that he prefers sleeping on the floor whatever the reason is, as in (39-A''). Sp and Ad's attempt to reach a non-defective context may have to continue after Ad's response, but every response to E*wh*-Qs must at least partially contribute to reaching the equilibrium.

(39)   S: *kimi-wa   **nani-o**   yuka-de   ne-tei-ru   no?*
             that.guy-TOP what-ACC floor-LOC sleep-PROG-NPST FIN
             lit. 'What are you sleeping on the floor?'
       A: *iya, beddo-ga kowareta n   da   yo.*
             no   bed-NOM broke   FIN COP SFP
             'No, my bed broke.'
       A': *iya, yuka-ga   suzusii n   da   yo.*
             no   floor-NOM cool   FIN COP SFP
             'No, I feel cool on the floor.
       A'': *iya, yuka-de   ne-tai   n   da   yo.*
             no   floor-LOC sleep-want FIN COP SFP
             'No, I just want to sleep on the floor. '

Note also that responses of type (i) must come with a cancellation of the s-presupposition. For instance, (39-A) becomes odd as a response to (39-S) if it is not accompanied by a cancellation particle *iya*.

(40)   A: ?*(iya,) beddo-ga kowareta n   da   yo.*
             no   bed-NOM broke   FIN COP SFP
             'No, my bed broke.'

The maintaining move in responses of type (ii) can be realized linguistically or non-linguistically. Ad can respond by promising to cease the described event after confirming the context's defectiveness, as in (41-A) (confirmation is realized by *hai* 'yes'), or by just silently ceasing the described event, as in (41-A'). In contrast to the modifying move, the maintaining move would immediately lead to a (at least superficially) non-defective context.

(41) S: *kimi-wa* **nani-o** *yuka-de ne-tei-ru* *no?*
that.guy-TOP what-ACC floor-LOC sleep-PROG-NPST FIN
lit. 'What are you sleeping on the floor?'

A: *hai, sumimasen. sugu oki-mas-u.*
yes sorry soon get.up-POL-NPST
'You're right, I'm sorry. I'll get up now.'

A': [Getting up from the floor without making any utterance]

Finally, Figure 2 summarizes the entire discourse dynamics of E*wh*-Qs in the form of '*nani-o p?*'. The connotations of surprise and annoyance are now captured as the side effects that arise at the time of observing p. As proposed in §5.2, the temporal recency condition must be in effect to give rise to the speaker's surprise. Also, as noted in §5.3, the feeling of annoyance more easily arises when the goals of the addressee are also shared by or relevant to the speaker.
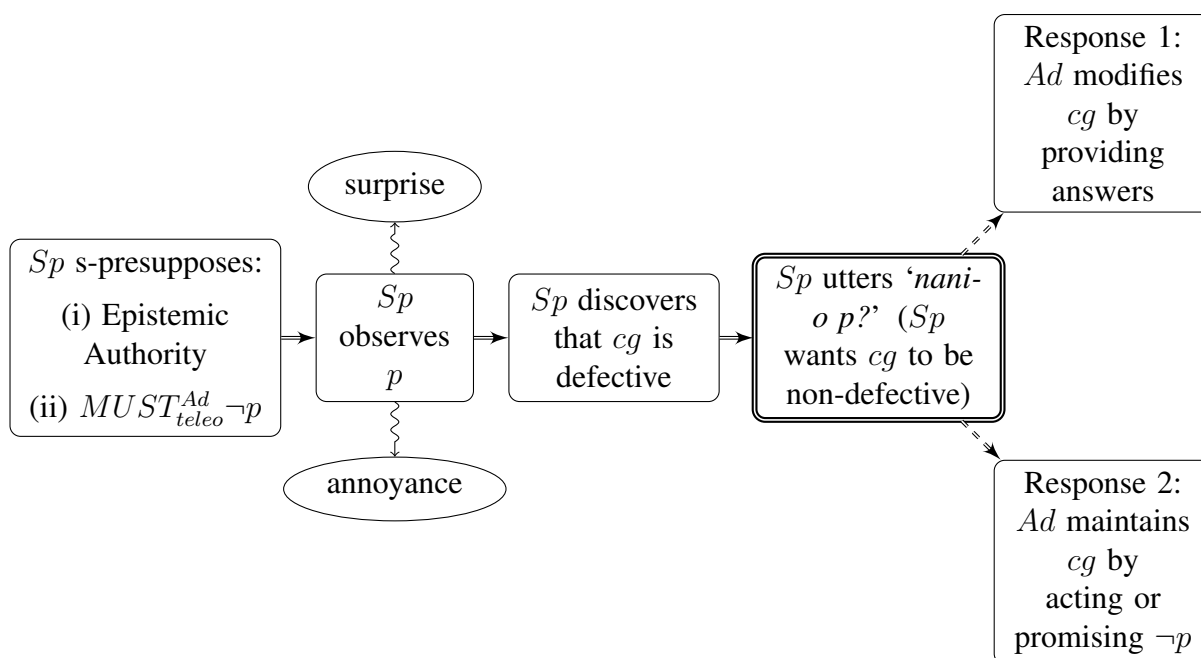

Figure 2: The discourse dynamics of '*nani-o p?*'

7   Conclusion and future directions

This study investigated the semantics and pragmatics of E*wh*-Qs. We observed that E*wh*-Qs are non-information-seeking despite their interrogative forms, and that their interpretations require the event agent's intentions and involve special emotional connotations of the speaker's. Specifically, we divided the emotional connotations into two types, i.e. surprise and annoyance, and showed that they should be treated independently. We captured these observations with the proposed semantic-pragmatics of E*wh*-Qs. On the compositional semantic side, we argued for a structure of E*wh*-Qs with two covert elements: a teleologically construed necessity modal, and *want*_EP that takes (the trace of) *nani-o* as its argument and predicates an agent's effective preferences. Crucially,

the presence of the two elements give rise to the interpretation that E*wh*-Qs ask which action-relevant goals of the agent's necessitate the occurrence of the described event. This ensures the intentionality requirement of E*wh*-Qs, since the events are restricted to those relevant to intention-based agentive actions. On the pragmatic side, we proposed that E*wh*-Qs s(peaker)-presuppose (the speaker as the) Epistemic Authority and Complement as Necessity. We showed that the interaction between the semantics and the pragmatics of E*wh*-Qs leads to the observed properties of E*wh*-Qs. The non-information-seeking nature of E*wh*-Qs is a result of the fact that the question meaning denoted by E*wh*-Qs is already answered by the s-presuppositions. The speaker's surprise also follows from the conflict between the described event and the s-presuppositions. The annoyance connotation is optional because it depends on whether the speaker shares with the event agent the same set of goals.

Given that E*wh*-Qs have been widely attested across languages, one obvious remaining issue is to check whether the current proposal can be carried over to E*wh*-Qs in other languages. We will leave a typological study of E*wh*-Qs for future research. Apart from that, we also face a broader theoretical issue with the current analysis. After all, there are questions with argumental *wh*-phrases interpreted similarly with E*wh*-Qs. In (42), for instance, the intuition is that (a) and (b) have the same pragmatic presuppositions.

(42)   Context: The robber shouting to his accomplice who is running toward the police station...

     omae {a. *nani-o*   *keisatsusho-ni*   / b. *doko-ni*}   *mukat-tei-ru*   *no?!*
     you   what-ACC police.station-DAT   where-DAT go-PROG-NPST FIN

     (a) lit. 'What are you going to the police station?'
     (b) 'Where are you going?!'

Should they also be treated as modalized questions for action-relevant goals like E*wh*-Qs, or just another variant of RQs? Ultimately, do ordinary RQs and E*wh*-Qs deserve a unified treatment? We hope our future research can make this clear.

References

AnderBois, Scott, Adrian Brasoveanu, and Robert Henderson. 2015. At-issue proposals and appositive impositions in discourse. *Journal of Semantics* 32:93–138.

Bartels, Christine. 1999. *The Intonation of English Statements and Questions: A Compositional Interpretation*. New York: Garland.

Caponigro, Ivano, and Jon Sprouse. 2007. Rhetorical questions as questions. In *Proceedings of Sinn und Bedeutung*, volume 11, 121–133.

Condoravdi, Cleo, and Sven Lauer. 2016. Anankastic conditionals are just conditionals. *Semantics & Pragmatics* 9:1–69.

Han, Chung-hye. 2002. Interpreting interrogatives as rhetorical questions. *Lingua* 112:201–229.

Hare, Richard Mervyn. 1968. Wanting: Some pitfalls. In *Agent, action and reason, Proceedings of the Western Ontario Colloquium*, ed. Robert Binkley, Richard Bronaugh, and Ausonio Marras.

Heim, Irene, and Angelika Kratzer. 1998. *Semantics in Generative Grammar*. Oxford: Blackwell.

Kaufmann, Magdalena. 2016. Fine-tuning natural language imperatives. *Journal of Logic and Computation* 29:321–348.

Kaufmann, Magdalena, and Stefan Kaufmann. 2015. Conditionals and modality. In *The Handbook of Contemporary Semantic Theory*, ed. Shalom Lappin and Chris Fox, 237–270. John Wiley & Sons, Ltd.

Kratzer, Angelika. 1981. The notional category of modality. In *Words, worlds, and contexts*, ed. Hans-Jürgen Eikmeyer and Hannes Rieser, 38–74. Berlin/New York: Walter de Gruyter.

Kratzer, Angelika. 1991. Modality. In *Semantik: Ein internationales handbuch der zeitgen ossischen forschung*, ed. Arnim von Stechow and Dieter Wunderlich, 639–650. Berlin/New York: Walter de Gruyter.

Krifka, Manfred. 2013. Response particles as propositional anaphors. In *Proceedings of SALT 23*, volume 23, 1–18.

Kurafuji, Takeo. 1996. Unambiguous checking. *MIT Working Papers in Linguistics* 29:81–96.

Lahiri, Utpal. 2002. *Questions and Answers in Embedded Contexts*. Oxford: Oxford University Press.

Levinson, Dmitry. 2003. Probabilistic model-theoretic semantics for *want*. In *Proceedings of SALT 13*, 222–239.

Lewis, David. 1973. *Counterfactuals*. Cambridge: Harvard University Press.

Nakao, Chizuru, and Miki Obata. 2009. When 'what' means 'why': On accusative wh-adjuncts in japanese. *University of Pennsylvania Working Papers in Linguistics* 15:18.

Ochi, Masao. 1999. Constraints on feature checking. Doctoral dissertation, University of Connecticut.

Ochi, Masao. 2015. Wh-adjuncts, Left Periphery, and Wh-in-situ. *Chinese Syntax in a Cross-Llinguistic Perspective', Oxford University Press, New York* 401–428.

Ochi, Masao, and Tien-Hsin Hsin. 1999. The syntax of adjunct WH-NPs. *University of Pennsylvania Working Papers in Linguistics* 6:22.

Rett, Jessica, and Sarah E. Murray. 2013. A semantic account of mirative evidentials. In *Proceedings of SALT*, 453–472.

Rieser, Lukas. 2017. Belief States and Evidence in Speech Acts: The Japanese Sentence Final Particle *no*. Doctoral dissertation, Kyoto University.

Stalnaker, Robert. 1978. Assertion. In *Syntax and Semantics 9*, ed. Peter Cole, 315–332. New York: Academic Press.