1. Introduction: Another kind of how-question

Typically, how-questions are assumed to involve wh-movement of an adjunct denoting manner or instrument (1a)-(1b). However, English how-questions can also have a very different, largely unnoticed interpretation: they can be used (rhetorically) to express extreme surprise that the proposition under how holds at all (1c). I will refer to these ‘propositional’ how-questions as PHQs, and to the more familiar manner and instrument how-questions collectively as MHQs.

1) How did John fix that chair?
   a. Very slowly and carefully.      (manner, MHQ)
   b. With a hammer.                (instrument, MHQ)
   c. I know! I didn’t think he could fix anything!  (propositional, PHQ)

My goal here is to provide an analysis of PHQs that accounts for their principal semantic, syntactic and morphological properties, focusing in particular on negation in PHQs.

2. Distinguishing manner/instrument MHQs from propositional PHQs

While many how-questions, like (1), are ambiguous between MHQ and PHQ readings, MHQs and PHQs can be distinguished by at least four properties.

First, PHQs can be used with all kinds of stative predicates, while MHQs cannot – presumably because manner/instrument modifiers are incompatible with states (Smith 1991:ch3, Katz 2000). For example, while fall asleep in (2) denotes a change of state, be asleep in (3) denotes a simple state (reinforced by the adverb still, which is used only with stative predicates (Katz 2000)). Correspondingly, the MHQ reading is available in (2) but not in (3).

2) How did Sarah fall asleep?
   a. By counting sheep.            (MHQ)
   b. I know – she was so wired at bedtime!  (PHQ)

3) How is Sarah still asleep?
   a. #By keeping her blinds closed. (#MHQ)
   b. I know – it’s been ten hours now!  (PHQ)

4) More examples of unambiguous PHQs with statives:
   a. How is that restaurant still open? (It’s 2:00a.m.!)  
   b. How do you hate this song? (It’s got such great lyrics!)  
   c. How has it already snowed six times? (It’s only October!)  
   d. How is Bill no longer the chair of Linguistics? (I thought he had a 6-year term.)  
   e. How are you still working on that paper?  
   f. How is anyone happy with these results?
Second, there is a difference in intonation: while *how* can be de-accented in a MHQ, it must bear pitch-accent in a PHQ:

5)  
   a. { Hów / hòw } did Sarah fall asleep?
   b. { Hów / ?*hòw } is Sarah still asleep?

Third, PHQs are fully compatible with sentential negation, showing none of the weak-island effects induced by negation in MHQs (Abrusán 2008, Ross 1984, Kuno & Takami 1997, etc.):

6)  
   How did John not fix that chair?
   a. #With a hammer. / #Carefully. (MHQ)
   b. I know! It looked like such a simple job! (PHQ)

7)  
   a. How is that restaurant not open yet? (all PHQs)
   b. How do you not love this song?
   c. How has it not snowed at all this winter?
   d. How is Bill not the chair of Linguistics anymore?

Oddly, however, while PHQs freely allow negation, they resist Neg-contraction to *n’t:

8)  
   a. ?* How isn’t that restaurant open yet?
   b. ?* How don’t you love this song?
   c. ?* How hasn’t it snowed at all this winter?
   d. ?* How isn’t Bill the chair of Linguistics anymore?

Some speakers that I have consulted reject sentences like (8) outright; others find them marginally acceptable. All have agreed, however, that there is a clear contrast in acceptability between the *how*-questions in (8) and the *why*-questions in (9), where Neg-contraction is fine:¹

9)  
   a. Why isn’t that restaurant open yet?
   b. Why don’t you love this song?
   c. Why hasn’t it snowed at all this winter?
   d. Why isn’t Bill the chair of Linguistics anymore?

The contrast between (7) and (8) (and between (8) and (9)) presents an interesting puzzle: Given that there’s no problem with negation *per se* in PHQs, why should it matter if the Neg morpheme is reduced to *n’t* or spelled out as *not*? I’ll offer the following explanation:

10)  
   **Proposal:** The problem arises when Neg raises to C. Raising allows Neg to undesirably scope over a VERUM operator in C that is responsible for the PHQ’s unique semantics.

¹ There is at least one other type of *how*-question, distinct from both PHQs and MHQs, which I have provisionally coined the ‘metalinguistic *how*-q’: e.g. *How is John a good husband?* (= ‘How can you say that John is a good husband?’). These questions are interpreted as challenges to another speaker’s use of a word or phrase (imagine scare quotes around *a good husband*); crucially, unlike PHQs they do not presuppose the proposition under *how*. I leave their analysis for future work, but an initial observation is that they seem to allow Neg-contraction more freely than PHQs do.
3. Analysis

Let’s start by establishing a baseline syntax for MHQs. I’ll assume, fairly uncontroversially, that manner/instrument modifiers are adjoined low, at the vP level; i.e., they modify predicates rather than propositions (Katz 2000; Thomason & Stalnaker 1973). In the MHQ in (11)a, correspondingly, how is initially merged as a vP adjunct and moves to Spec,CP.

Now consider the PHQ in (11)b. Notice two key differences between the MHQ and the PHQ:

- The PHQ has a covert semantic operator, VERUM, in C.
- PHQ how is initially merged in Spec,CP.

I provide arguments for each of these claims in §3.1 and §3.2.

11) a. Manner/instrument how-q (MHQ) b. Propositional how-q (PHQ)

3.1 Why VERUM? Let’s start with the question: What exactly does a PHQ mean? As an initial observation, the PHQ in (12) simultaneously achieves both (12)-i and (12)-ii:

12) How do you hate this song?
   (i) acknowledges the truth of the proposition You hate this song
   (ii) expresses extreme surprise at the truth of the proposition You hate this song

A PHQ is arguably an attempt to resolve an internal epistemic conflict (cf. Romero & Han 2004): the speaker previously believed that p was nearly impossible, and now must recognize the certainty of p. The implicit question is ‘What caused such an unlikely reversal?’ – a question with an existentialist flavor that usually ends up being interpreted rhetorically.

I propose that the PHQ’s interpretation comes about via the combination of how\_p (propositional how) in Spec,CP and a covert VERUM operator in C.
13) \([\text{how}_r]^2 = \lambda r. \text{What is the } q \text{ such that } \text{CAUSE}(q,r)?\) 
(where ‘cause’ means ‘provide sufficient condition for’ (Tsai 2008))

14) \([\text{VERUM}] = \lambda p. \text{It is for-sure that } p \text{ should be added to the Common Ground (CG)}\) 
(Romero & Han 2004) (CG is the set of propositions that participants in a conversation assume to be true.)

- VERUM, according to Romero & Han 2004, is a conversational epistemic operator that asserts the speaker’s certainty that a proposition should be added to CG (similar to really in Sarah really is still asleep).

- Suppose that the purpose of VERUM in the PHQ is to rule out the possibility that there is some mistake about the truth of \(p\). This could be the source of the ‘extreme surprise’ interpretation of a PHQ: The addition of VERUM to \(p\) yields an implicature that \(p\) is particularly unlikely or hard to believe (otherwise VERUM would be unnecessary information, per Grice’s (1975) Quantity-2 maxim).

15) \([\text{how}_r \text{ VERUM } p]] = ‘\text{What is the } q \text{ such that } q \text{ caused it to be for-sure that } p \text{ should be added to CG?’}"

3.2 PHQ how starts in Spec,CP. As noted in (12)-i and (13), PHQ how combines with and presupposes a complete proposition, with no missing arguments or other gaps. By assuming that PHQ is initially merged in Spec,CP, we account for this observation as well as the following:

- PHQ how always takes scope over sentential negation, while MHQ how is interpreted under negation and is correspondingly subjected to weak-island effects (see (6)-(7)).

16) PHQ: \([\text{CP how does [TP John [NegP not [vP love this song ]]]] \quad \text{HOW > NEG}\]  
   i. = ‘I am surprised that John does not love this song.’
   ii. \(\text{presupposes ‘John does not love this song.’}\)

17) #MHQ: \([\text{CP how, did [TP John [NegP not [vP fix that car how]]]]] \quad \text{NEG > HOW}\]  
   i. = ‘What is an instrument/manner that John didn’t use to fix the car?’
   ii. \(\text{does not presuppose ‘John did not fix the car.’}\)

- PHQ how always takes scope over subjects, including quantified subjects.

18) a. How is only one child asleep? \(\text{presupposes ‘Only one child is asleep.’}\)
   b. How is nobody asleep? \(\text{presupposes ‘Nobody is asleep.’}\)

- While MHQs with universal quantifiers allow ‘family of questions’ readings, PHQs do not. In the MHQ in (19), everyone c-commands the trace of the vP-adverb how, enabling a

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2 I distinguish \(\text{how}_r\) (PHQ how) from \(\text{how}_q\) (manner/instrument how), which combines with predicates rather than propositions. An interesting question is whether \(\text{how}_r\) ever occurs in contexts other than PHQs in English (i.e. without VERUM). One possibility is that \(\text{how}_r\) without VERUM is realized as (part of) how come; compare How come Sarah’s still asleep? to the PHQ How is Sarah still asleep? I leave this possibility open for future work; see Tsai 2008, Collins 1991 for treatments of how come.
family-of-questions response (May 1985). In the PHQ in (20), however, *how* is never c-commanded by *everyone*, and no family-of-questions reading is possible.

19) Q: **How** did everyone [*vP* get to sleep *how*]? (MHQ)
   A: John counted sheep, Mary listened to soft music, Sam drank warm milk...

20) **How** is [*TP everyone* still asleep]? (PHQ)
   = ‘I am surprised that everyone is still asleep.’
   ≠ ‘I am surprised that John is still asleep, I’m surprised that Mary is still asleep,
   I’m surprised that Sam is still asleep...’

- PHQ *how*, unlike MHQ *how*, does not allow (attempted) *wh* in situ in an echo question – as expected, if PHQ *how* does not move from a clause-final position in the first place.

21) a. John fixed the car *how*? (MHQ)
    b. #You hate this song *how*? (PHQ)

3.3 Now, why no Neg-contraction? With these ingredients in place, we can propose an answer to the question posed in §2, paraphrased below:

22) **Question**: Given that sentential negation is freely permitted in PHQs, why does it matter if Neg is contracted to *n’t* or spelled out as *not*?
   a. How does John not love this song?
   b. ?* How doesn’t John love this song?
   c. cf. Why doesn’t John love this song?

I assume that there are two basic steps to deriving a question with *n’t* like (22)c:
- **Step 1 (Syntax)**: Neg raises to T and then to C by syntactic head-movement ((23)a).
- **Step 2 (PF)**: [+NEG] is spelled out as *n’t* by the allomorphy rule in (23)b.

23) a. Cyclic head movement (Neg to T to C) in a negative *why*-question
   
   ![Diagram](image)

   b. Vocabulary Insertion for [+NEG]:
      
      \[
      [+\text{NEG}] \leftrightarrow \text{n’t} / X+\underbrace{\text{not}}_{(\text{elsewhere})}
      \]
      (where ‘X+Y’ means ‘X is left-adjacent to Y within the same (M-)word’ (Embick 2010))
Now let’s consider negative PHQs. First, notice that in an embedded PHQ, where Neg raises only to T, n’ t is fine:

24) I want to know [CP how [C VERUM] [TP John [T does [n’t]]] [NegP t [vP love this song ]]]

What this suggests is that the problem with (22)b is not the spellout of Neg as n’t (Step 2), but rather has to do with Step 1, the raising of Neg to C – where VERUM is.

Romero & Han (2004) argue that when Neg raises to C of VERUM in an English negative yes/no question like Isn’t Jane coming?, an ambiguity results (see Ladd 1981 for this observation):


   [CP [C [T is [Neg n’t]] VERUM ] [TP there t [NegP t [vP a vegetarian restaurant here ]]]]

   a. Q > NEG > VERUM > p
      ‘It’s not for-sure that we should add to CG that there’s a veg. restaurant here;
      ‘it is for-sure that we should add to CG that there’s a veg. restaurant here.’

   b. Q > VERUM > NEG > p
      ‘It is for-sure that we should add to CG that there’s not a veg. restaurant here;
      ‘it is not for-sure that we should add to CG that there’s not a veg. restaurant here.’

VERUM, according to Romero & Han, accounts for the bias in English negative yes/no questions. Reading (a) is intended in a context where the speaker is biased towards believing that there is a vegetarian restaurant nearby (e.g. (26)a), while (b) is intended in a context where the speaker is biased towards believing that there is not a vegetarian restaurant nearby (e.g. (26)b).

26) a. A: Let’s get something to eat.
    B: Okay, isn’t there a vegetarian restaurant around here? Moosewood or something?

   b. A: I know you don’t eat meat, so we’ll have to take a taxi to dinner.
    B: Oh really, isn’t there a vegetarian restaurant around here?

If Romero & Han are correct that Neg and VERUM interact in this way when Neg raises to C, then we have a plausible explanation for why Neg-to-C is inhibited in PHQs:

27) Neg-to-C is dispreferred in PHQs because it creates an undesired scopal ambiguity.

   a. Intended: how_p > VERUM > NEG > p
      ‘What is the q such that q caused it to be for-sure that ~p should be added to CG?’

   b. Unintended: * how_p > NEG > VERUM > p
      ‘What is the q such that q caused it not to be for-sure that p should be added to CG?’

If Neg is left in situ below C of VERUM, this ambiguity is avoided.

28) [CP how [C [T does_i ] VERUM ] [TP John t [NegP not [vP love this song ]]]] VERUM > NEG

4. Further support, implications, and directions for future work

• Support from negative MHQs: Recall that in manner/instrument how-questions (MHQs), how is initially merged as a vP adjunct and there is no VERUM in C. We also saw that negative MHQs are subjected to weak-island effects (29). But as noted by Kroch 1989, these weak-island effects can be removed by contextual conditions (30):
29) A. How did John not fix that chair?  B. # With a hammer.
30) John tried everything! The real question is: how didn’t he fix the chair?

Notice that Neg-contraction is fine in (30). This is just what we expect under the current analysis, since there is no VERUM to inhibit Neg-to-C raising in MHQs.

- My approach to PHQs suggests that the scopal interactions that appear to apply between Neg and VERUM in yes/no questions (Romero & Han 2004) apply across contexts, as expected. A question for future work is whether a similar analysis could be extended to other contexts where Neg-contraction is disfavored, e.g. Neg-inversion and V1 conditionals:

31) a. No way does John not like Mary.
   b. *No way doesn’t John like Mary.
   a. Had I not been there, I wouldn’t have met you.
   b. *Hadn’t I been there, I wouldn’t have met you.

- The current analysis is also very much in line with previous observations that English n’t is fundamentally different from ‘other clitics,’ e.g. ‘ll, ’ve (Zwicky & Pullum 1983). Crucially, I have argued that n’t attaches to its host by syntactic head-movement rather than by local rebracketing in a postsyntactic PF component (Embick & Noyer 2001, Mackenzie 2012). Given that n’t is syntactically derived, its semantic effects seen here are unsurprising.

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References
Han, Chung-hye & Siegel, Laura. 1996. NPI licensing in adjunct WH-questions. Proceedings of BLS 22, 147-158.