

# Evidentials and Questions in Cheyenne\*

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## 1. Introduction

On one view, the point of an assertion is to update the common ground (Stalnaker 1978, Karttunen 1974). On another, the point of an assertion is to propose an update to the common ground (Groenendijk 2009, Mascarenhas 2009, and related work on the structure of discourse, e.g., Ginzburg 1996, Roberts 1996, Gunlogson 2001). In Murray (to appear), I merge these two views. I argue based on evidence from declarative sentences with evidentials that assertion has two components: what is at-issue and what is not. The not-at-issue component of assertion is added directly to the common ground while the at-issue component is proposed to be added to the common ground.

Here, I extend this analysis to yes/no questions in Cheyenne and their interaction with evidentials. I propose that the distinction between what is at-issue and what is not is also present in questions, and that it can be modeled in the same way. Specifically, both declarative and interrogative sentences make two contributions: they restrict and structure the common ground. The restriction is based on the not-at-issue component while the structuring relation is based on the at-issue component.

The proposed analysis utilizes aspects of two existing approaches to the semantics of questions. On one approach, questions are analyzed as sets of possible direct answers (Hamblin 1973, Karttunen 1977). On the other, questions are analyzed as partitions on a set of worlds (Groenendijk and Stokhof 1984), in some versions a partition on the common ground (Groenendijk 1999). I build on Hamblin's (1973) analysis of sentences as sets of propositions to distinguish what is at-issue from what is not. In addition, I analyze the structuring relation contributed by interrogatives as an equivalence relation on the common ground, following Groenendijk and Stokhof (1984) and Groenendijk (1999).

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This paper is structured as follows. In Section 2, I give an overview of the Cheyenne evidential system and discuss the two types of Cheyenne yes/no questions. The analysis for Cheyenne evidentials in declarative sentences is given in Section 3, summarizing the proposal in Murray (to appear). Evidentials are analyzed as making two contributions: an evidential restriction and an illocutionary relation. I extend this proposal to yes/no interrogatives in Section 4, analyzing them as also contributing an evidential restriction and an illocutionary relation. Section 5 is the formal implementation of this proposal, based on the analysis of interrogative and declarative sentences in Hamblin (1973). In Section 6, I discuss the compositional properties of this implementation. Section 7 is the conclusion.

## 2. Cheyenne Data

In Cheyenne<sup>1</sup>, a Plains Algonquian language spoken in Montana and Oklahoma, verbs have a templatic structure. Matrix verbs inflect for illocutionary mood, which occurs in the outermost suffix slot. This ‘mode’ slot can be filled by an evidential, an imperative, or a yes/no question marker, among other illocutionary moods.

An excerpt of the illocutionary mood paradigm is given below in (1). It illustrates the alternation of the evidential suffixes, e.g., the reportative in (1b), with illocutionary mood markers such as the yes/no interrogative in (1c). Yes/no questions can also be formed with the clitic *mó=*, which is compatible with the evidential suffixes, as in (1a’) and (1b’).

- (1) Evidentials and illocutionary mood
- |   |   |   |
|---|---|---|
| <p>a. <u>Direct evidential</u><br/>É-néméne-Ø<br/>3-sing-DIR<br/>‘He sang, I’m sure’</p>              | <p>a’. <u>Direct evidential in a question</u><br/>Mó=é-néméne-Ø<br/>y/n=3-sing-DIR<br/>‘Given what you know, did he sing?’</p>                |   |
| <p>b. <u>Reportative evidential</u><br/>É̄-nemene-séstse<br/>3-sing-RPT.3SG<br/>‘He sang, I hear’</p> | <p>b’. <u>Reportative evidential in a question</u><br/>Mó=é-nemene-séstse<br/>y/n=3-sing-RPT.3SG<br/>‘Given what you heard, did he sing?’</p> |   |
| <p>c. <u>Interrogative</u><br/>Né-nemene-<b>he</b><br/>2-sing-Y/N<br/>‘Did you (sg.) sing?’</p>       | <p>d. <u>Imperative</u><br/>Néméné-<b>stse</b><br/>sing-IMP.2SG<br/>‘(You (sg.)) sing!’</p>   | <p>e. <u>Optative</u><br/>Némene-<b>ha</b><br/>sing-OPT.3SG<br/>‘Let him sing!’</p> |

In Cheyenne, sentences with the default direct evidential, e.g., (1a), are stronger than unmarked English sentences, such as *He sang*. Cheyenne (1a) commits the speaker to having direct evidence for the proposition in the scope of the evidential. This strengthening is represented in the translations with a parenthetical, as in *He sang, I’m sure* for (1a).

<sup>1</sup>Cheyenne data is from the author’s fieldwork with native speakers on the Northern Cheyenne Indian Reservation in Montana, supplemented with paradigms from a Cheyenne Grammar (Leman 1980).

Though there is a four-way evidential distinction in Cheyenne between the unmarked direct evidential and three overtly marked indirect evidentials, in this paper I discuss only the reportative and the direct. However, the patterns and proposed analysis can be extended to the other two indirect evidentials: the inferential and the ‘mediate’, a hearsay marker used only in stories (in the distant past) or for mirative effect (in the present).

Cheyenne evidentials in declarative sentences behave similarly to parenthetical-like, or ‘illocutionary’, evidentials in other languages, such as Cuzco Quechua (Faller 2002).<sup>2</sup> Like English parentheticals, evidentials in Cheyenne scope out of certain operators, including modals and negation. For example, the English sentence *Lucy may have left, I hear* cannot be interpreted as *It is possible that I have heard that Lucy left*. That is, the parenthetical cannot be interpreted in the scope of the modal. The same is true of evidentials in Cheyenne.

In addition, like parentheticals, Cheyenne evidentials cannot be challenged or denied. For example, consider the English sentence *Leo is in the hospital, I hear*. The main clause can be challenged (*✓That’s not true, he’s in jail!*) but the parenthetical contribution cannot be (*#That’s not true, you didn’t hear that*). Cheyenne sentences with evidentials are similar: the proposition in the scope of the evidential can be challenged, but the evidential contribution cannot be. For example, (1b) can be challenged by *✓That’s not true, he danced!* but not by *#That’s not true, you didn’t hear that*.

In Cheyenne, and in other languages with parenthetical-like evidentials, the scope of the reportative can be false, as in (2) (see also Faller 2002, Aikhenvald 2004, Bittner 2008, Murray to appear).<sup>3</sup>

- (2) (i) É-hó'táheva-**séstse** Floyd naa+oha (ii) é-sáa-hó'táheva-he-Ø  
 3-win-RPT.3SG Floyd but 3-NEG-win-*h(an)e*-DIR  
 ‘Floyd won, I hear, but I’m certain he didn’t.’

Examples like (2) are not felicitous for reportatives in all languages. For example, in St’át’imcets, which has modal-like evidentials, (2) is infelicitous: the proposition in the scope of the reportative must be at least an open possibility (Matthewson et al. 2008).

While the scope of the reportative can be false in Cheyenne, the speaker is committed to having reportative evidence for that scope proposition. With the direct evidential, the speaker is committed both to the truth of the scope proposition and to having direct evidence for that proposition. Thus, the scope of the direct evidential cannot be false, as shown in (3), which is a contradiction (*#<sub>⊥</sub>*).

- (3) *#<sub>⊥</sub>* (i) É-hó'táhéva-Ø Floyd naa+oha (ii) é-sáa-hó'táheva-he-Ø  
 3-win-DIR Floyd but 3-NEG-win-*h(an)e*-DIR  
*#<sub>⊥</sub>* ‘Floyd won, I’m sure, but I’m certain he didn’t.’

<sup>2</sup>There are two notable exceptions. First, the Cheyenne reportative is limited to reporting secondhand information – regardless of whether it was heard, overhead, read, etc. Second, the reportative agrees with an argument of the verb. For example, the reportative in (1b) is the third-person singular form (-RPT.3SG). Neither of these properties are discussed in detail in this paper.

<sup>3</sup>Examples (2) and (3) adapted from Quechua data given in Faller (2002, 2006).

As part of the illocutionary mood paradigm, evidentials are in morphological alternation with the interrogative mood suffix *-he* (see (1c)). As a result, *-he* questions are incompatible with evidentials. However, yes/no questions can also be formed with the interrogative clitic<sup>4</sup> *mó=*. This clitic is compatible with evidentials, as in (1a') and (1b').

These two types of yes/no questions have different felicitous answers. Questions formed with the interrogative mood suffix *-he* can be answered with any evidential. For example, (4Q) can be answered by either (4A<sub>1</sub>), which contains a reportative evidential, or (4A<sub>2</sub>), which contains a direct evidential.

- (4) Q: É-nemene-**he** Floyd  
 3-sing-Y/N Floyd  
 'Did Floyd sing?'/ 'Given your evidence, did Floyd sing?'
- ✓A<sub>1</sub>: Héehe'e é-nemene-**séstse** ✓A<sub>2</sub>: Héehe'e é-néméne-∅  
 Yes 3-sing-RPT.3SG Yes 3-sing-DIR  
 'Yes, he sang, I hear.' 'Yes, he sang, I'm sure.'
- (5) Q: Mó=é-nemene-**séstse** Floyd  
 y/n=3-sing-RPT.3SG Floyd  
 'Given what you heard, did Floyd sing?'
- ✓A<sub>1</sub>: Héehe'e é-nemene-**séstse** #A<sub>2</sub>: Héehe'e é-néméne-∅  
 Yes 3-sing-RPT.3SG Yes 3-sing-DIR  
 'Yes, he sang, I hear.' 'Yes, he sang, I'm sure.'

In questions formed with the clitic *mó=*, such as (5Q), the evidential specifies the type of evidence for the requested answer. The question (5Q) contains a reportative evidential and only (5A<sub>1</sub>), which also contains a reportative evidential, is a felicitous answer. (5A<sub>2</sub>), which contains a direct evidential, is not a felicitous answer to (5Q).

Though Cheyenne evidentials scope out of certain operators, like modals, the yes/no interrogative clitic in (5Q) must have wide scope. That is, (5Q) has only the question interpretation given in (5Q). It cannot be interpreted as a reported question, e.g., '[she] asked, did Floyd sing?', an attested interpretation of parenthetical-like reportative evidentials in wh-questions (Faller 2002, Bittner 2008).

### 3. Evidentials in Declaratives

In the literature on evidentials, it has been argued that declarative sentences with evidentials make two contributions, called the propositional and evidential contributions, and that these contributions need to be distinguished (Faller 2002, Matthewson et al. 2008, Murray to appear, see also Section 2, above). For example, Cheyenne (6), which contains a direct evidential, makes both of these contributions.

<sup>4</sup>This clitic is most likely a contracted form of *móhe*, which, by itself, is a question loosely translated as 'Really?'. The clitic *mó=* can also attach to demonstratives and nouns, which is not possible for *-he*.

- (6) É-néméne-Ø Floyd  
 3-sing-DIR Floyd  
 ‘Floyd sang, I’m sure.’

The propositional contribution of (6) is the proposition that Floyd sang. This is the ‘main point’ of the sentence; it is the at-issue, negotiable contribution of the sentence. When a speaker (assertively) utters (6), she proposes to add the information that Floyd sang to the common ground – the information that the conversational participants take for granted for the sake of conversation, regardless of what they actually believe (Stalnaker 1978, 2002). However, her interlocutors may felicitously object to (6) with *No he didn’t!* or *That’s not true! Floyd didn’t sing, it was Andy!*

The evidential contribution of (6) is the requirement that the speaker has direct evidence for the proposition in the evidential’s scope, the proposition that Floyd sang. The contribution of the direct evidential entails that the speaker is certain of the scope proposition. This evidential contribution is not the main point of the utterance; it is not at-issue and not up for negotiation. It cannot be directly challenged or denied. For example, it is infelicitous to reply to (6) with *No you aren’t!* or *No you don’t!* The evidential contribution in declarative sentences is new information that reduces the common ground, not information which is presupposed, or cancellable (see Murray to appear for further arguments).

I propose that Cheyenne sentences with evidentials be analyzed as encoding a distinction in assertion between what is at-issue and what is not. I call the two contributions of sentences with evidentials the EVIDENTIAL RESTRICTION and the ILLOCUTIONARY RELATION. For (6), the evidential restriction reduces the input common ground<sup>5</sup>  $c_0$  to the worlds where the speaker  $i$  is certain of the proposition  $p$  that Floyd sang (written as  $CRT(i, p)$ , shown in Figure 1, below). This restriction represents the evidential contribution. It is non-negotiable and added directly to the common ground. The new common ground is  $c_1$ , the intersection of  $c_0$  and  $CRT(i, p)$ .

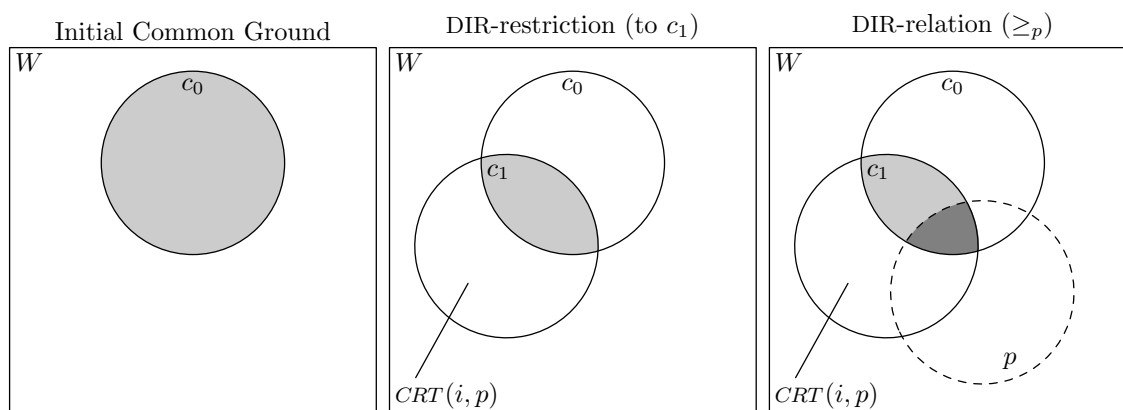


Figure 1: The two contributions of (6): 3-sing-DIR Floyd

<sup>5</sup>Here, the common ground is treated as the intersection of a set of propositions – a set of worlds – by some terminologies the ‘context set’.

The illocutionary relation contributed by (6) represents the proposal to add the at-issue proposition  $p$ , the proposition that Floyd sang, to the restricted common ground  $c_1$ . This proposal is negotiable; it is felicitous to object to (6) with *No he didn't [sing]*. I propose to model this illocutionary relation as an ordering relation on the current context  $c_1$  which orders  $p$ -worlds over  $\neg p$ -worlds:  $\langle c_1, \geq_p \rangle$ .<sup>6</sup> The output is a common ground that is restricted (by the evidential restriction) and structured (by the illocutionary relation). If the proposal is accepted, i.e., if no one objects, the set of the top-ranked worlds (darker grey) becomes the new common ground, eliminating all  $\neg p$ -worlds.

Cheyenne (7), which contains a reportative evidential, has the same at-issue proposition as (6), but contributes a different evidential restriction and illocutionary relation.

- (7) É-nemene-séstse Floyd  
 3-sing-RPT.3SG Floyd  
 ‘Floyd sang, I hear.’

The evidential restriction contributed by the reportative in (7) reduces the input common ground  $c_0$  to the worlds where the speaker has heard the at-issue proposition, here,  $p$ , that Floyd sang (written  $HRD(i, p)$ , in Figure 2).

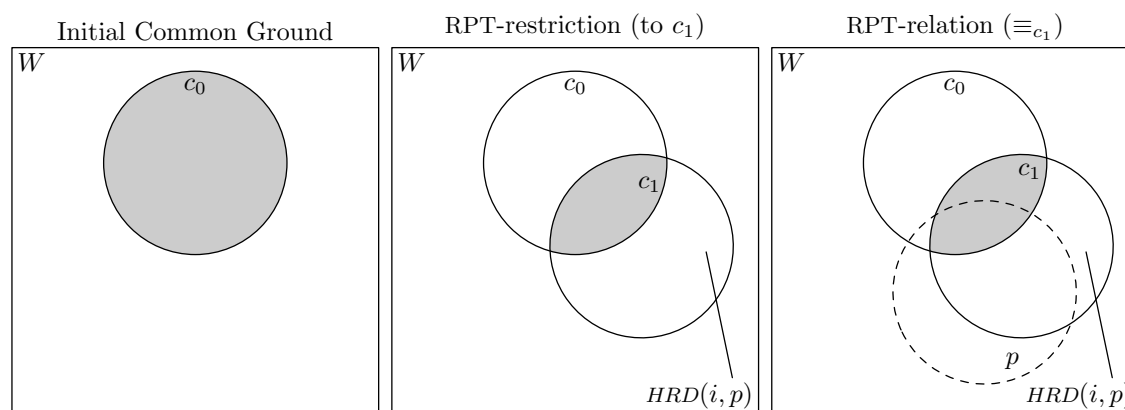


Figure 2: The two contributions of (7): 3-sing-RPT.3SG Floyd

The illocutionary relation contributed by (7) is a proposal to take note of the at-issue proposition  $p$ , not to add  $p$  to the common ground (as with DIR). I represent this as an equivalence relation which ranks all common ground worlds on a par:  $\langle c_1, \equiv_{c_1} \rangle$ . In particular,  $p$ -worlds and  $\neg p$ -worlds are equally preferred. If the proposal is accepted, the new common ground will become the set of top-ranked worlds. However, since all worlds are equally ranked, they are all top-ranked, and the current common ground  $c_1$  will remain unchanged.

This analysis of the reportative is intended to capture the intuition that propositions in the scope of a reportative evidential are ‘presented’ by the speaker as information she heard but need not believe. The analysis proposed in this paper accounts for this by assigning a different type of illocutionary relation to the reportative evidential. The analysis

<sup>6</sup>See Lewis (1973, 1981), Kratzer (1981) for related work on ordering relations.

need not appeal to a new type of speech act to account for the contribution of the reportative evidential (c.f. Faller 2002). In addition, other illocutionary moods can be analyzed as contributing an illocutionary relation, as in Section 4 for the interrogative.<sup>7</sup>

#### 4. Evidentials and Questions

Cheyenne questions formed with the yes/no interrogative clitic  $m\acute{o}=\text{}$ , as in (8Q), are compatible with evidentials. The evidential specifies the type of evidence that felicitous answers can be based on. In (8) (abbreviated from (5)) the clitic  $m\acute{o}=\text{}$  occurs with the reportative evidential. Question (8Q) is felicitous in a context where it is clear the addressee will have reportative evidence for her answer, e.g., if she has just been on the telephone.

- |     |   |  |
|-----|---|--|
| (8) | Q: $M\acute{o}=\acute{e}\text{-nemene-s\acute{e}stse}$ Floyd<br>y/n=3-sing-RPT.3SG Floyd<br>'Given what you heard, did Floyd sing?' | A <sub>1</sub> : ✓ yes, 3-sing-RPT<br>A <sub>2</sub> : # yes, 3-sing-DIR |
|-----|---|--|

Felicitous answers to (8Q) will contain the reportative, as in (8A<sub>1</sub>), with the evidential anchored to the addressee (not the speaker) of the question.

I propose an analysis of  $m\acute{o}=\text{}$  questions parallel to the analysis of declarative sentences with evidentials given in Section 3. (8Q) contributes both an evidential restriction and an illocutionary relation. The evidential restriction reduces the input common ground  $c_0$  to the worlds where either the addressee  $u$  heard the proposition  $p$  that Floyd sang (written  $HRD(u, p)$ , in Figure 3, below) or the addressee  $u$  heard that  $\neg p$  (written as  $HRD(u, \neg p)$ ). However, question (8Q) is only felicitous in such a context – one where it is clear the addressee has reportative evidence for her answer, whatever her answer is. That is, the evidential restriction of (8Q) must be entailed by the input common ground – it is a presupposition in the sense of Stalnaker (1973) and the common ground  $c_0$  remains unchanged.

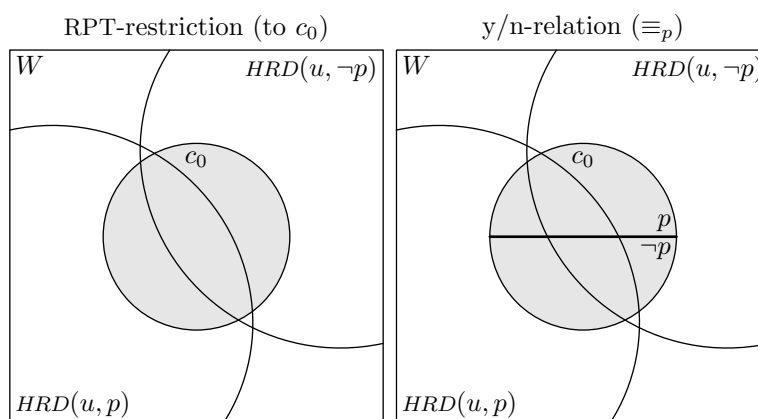


Figure 3: The two contributions of (8Q): y/n=3-sing-RPT.3SG Floyd

<sup>7</sup>This analysis has the potential to be further extended to the other matrix illocutionary moods, e.g., the imperative and the optative (see work on illocutionary mood, e.g., Schwager 2006, Bittner 2009).

The illocutionary relation contributed by (8Q) represents a question, which can be thought of as the proposal to either add  $p$ , the proposition that Floyd sang, or  $\neg p$  to the common ground (as in Groenendijk 2009). Following the analysis of polar questions in Groenendijk and Stokhof (1984), I propose to model this illocutionary relation as an equivalence relation on the current common ground  $c_0$ :  $\langle c_0, \equiv_p \rangle$ . The output is a common ground that is (vacuously) restricted (it entails the evidential restriction) and structured (by the illocutionary relation). Possible answers to this question are either  $p$  or  $\neg p$  with the reportative evidential, e.g., (8A<sub>1</sub>) ‘Yes, he sang, I hear’ but not (8A<sub>2</sub>) ‘Yes, he sang, I’m sure’.

The other strategy for forming polar questions in Cheyenne involves the illocutionary mood suffix *-he*, which morphologically alternates, and therefore cannot co-occur, with the evidential suffixes. In contrast to *mó=* questions, *-he* questions allow answers with any evidential. For example, in (9) (abbreviated from (4)) a *-he* question (9Q) can be answered with a reportative evidential, e.g., (9A<sub>1</sub>), or a direct evidential, e.g., (9A<sub>2</sub>).

- |     |  |  |
|-----|--|--|
| (9) | Q: É-nemene- <b>he</b> Floyd<br>3-sing-Y/N Floyd | A <sub>1</sub> : ✓ yes, 3-sing-RPT<br>A <sub>2</sub> : ✓ yes, 3-sing-DIR |
|     | ‘Given your evidence, did Floyd sing?’           |  |

I propose that Cheyenne questions formed with the interrogative mood suffix *-he* be analyzed as contributing both an evidential restriction and an illocutionary relation, just like declarative sentences with evidentials. The evidentials and the y/n interrogative suffix are thus analyzed as forming a natural semantic class.

For (9Q), the evidential restriction reduces the input common ground  $c_0$  to worlds where either the addressee  $u$  has some type of evidence for the proposition  $p$ , that Floyd sang, (written as  $REVI(u, p)$ , shown in Figure 4, below) or the addressee  $u$  has some type of evidence for  $\neg p$  (written as  $REVI(u, \neg p)$ ). However, question (9Q) is only felicitous in such a context – one where it is clear the addressee has some type of evidence for their answer, whatever the answer is. That is, the evidential restriction of (9Q) must be entailed by the input common ground  $c_0$  – it is a presupposition in the sense of Stalnaker (1973) and the common ground  $c_0$  remains unchanged.

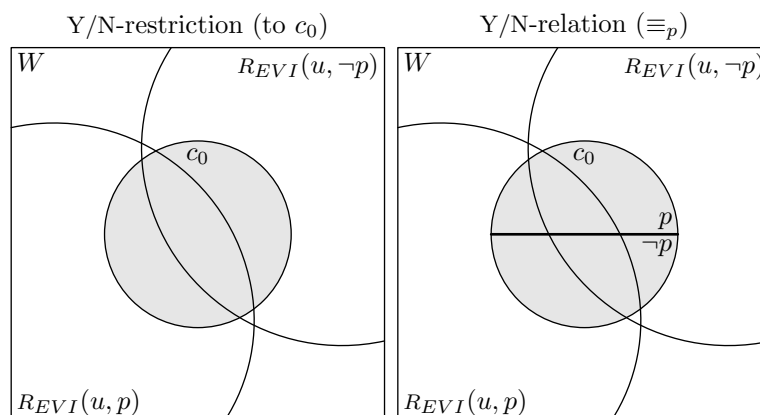


Figure 4: The two contributions of (9Q): 3-sing-Y/N Floyd

The illocutionary relation contributed by (9Q) represents a question, which, like the Cheyenne question formed with  $m\acute{o}=\$  in (8Q), can be thought of as the proposal to either add  $p$  or to add  $\neg p$  to the common ground. I propose to model the illocutionary relation contributed by (9Q) as an equivalence relation on the current context  $c_0$ :  $\langle c_0, \equiv_p \rangle$ . The output is a common ground that is trivially restricted (it entails the evidential restriction) and structured (by the illocutionary relation). Possible answers to this question are either  $p$  or  $\neg p$  with any evidential, including (9A<sub>1</sub>) ‘*Yes, he sang, I hear*’ or (9A<sub>1</sub>) ‘*Yes, he sang, I’m sure*’.

## 5. Formal Semantic Representation

I implement the above proposal by building on the analysis of interrogative and declarative sentences in Hamblin (1973), where both are treated as sets of propositions, as in (10), given in Ty<sub>2</sub> (Gallin 1975). An interrogative sentence is treated as the set of possible (direct) answers to the question, as in (10a), while a declarative sentence is treated as the (at most) singleton set of the proposition expressed, as in (10b).

- (10) a. Who sang?  $\rightsquigarrow \lambda p. \exists x(\text{person}(x) \wedge (p = \lambda w.\text{sang}(w, x)))$   
 b. Floyd sang.  $\rightsquigarrow \lambda p. (p = \lambda w.\text{sang}(w, \text{floyd}))$

Each translation in (10) represents (the characteristic function of) a set of propositions. The identity condition specifies which proposition(s), if any, will make it into the set. The interrogative in (10a) has an additional restriction: the first conjunct, that  $x$  be a person. This person restriction also affects which propositions make it into the set.

I propose to build on Hamblin’s (1973) analysis to capture both the distinction between the two contributions of sentences with evidentials and the semantic parallels between evidentials and illocutionary moods in Cheyenne. Consider the Hamblin-style translation in (11b) of Cheyenne (6) from Section 2. Like in (10), (11b) contains an identity condition, which identifies the at-issue proposition. In addition, (11b) is enriched with further conditions, similar to the person restriction in (10a): an evidential restriction (second conjunct) and an illocutionary relation (third conjunct).

- (11) a. (6) 3-sing-DIR Floyd  
 b.  $\lambda p. (p = \lambda w.\text{sang}(w, \text{floyd})) \wedge \text{CRT}(v_0, i, p) \wedge p(v_0) \leq p(v_1)$

The set characterized by (11b) is the singleton of the at-issue proposition if each of the three conditions is met, the empty set otherwise. The translation in (11b) contains two free variables,  $v_0$  and  $v_1$ , which are used to define the evidential restriction and illocutionary relation. I use the constants  $i$  and  $u$  for the speaker and the addressee, respectively, and the assignment function to represent the other features of the context.

So far, the implementation does not say anything about context change. However, an elementary update operation can be defined by binding the variable  $v_0$ :

**Definition 1** (Evidential Restriction). For a common ground  $c$ , a model  $\mathcal{M}$ , and an  $(st)t$  term  $P$ ,  $c$  updated with  $P$  is defined as:

$$c[P] = \{w \in c \mid \exists g \exists p \in D_{st}(\llbracket \lambda v_0.P \rrbracket^{\mathcal{M},g}(w) = \{p\})\}$$

This definition takes an input common ground and returns the subset of worlds where the evidential restriction is true. In declarative sentences, this amounts to a nontrivial restriction where the common ground is reduced; it is an assertion of the not-at-issue proposition (evidential contribution). In questions, this amounts to a trivial restriction; it represents the presupposition of the not-at-issue proposition. For example, take Definition 1 applied to (11b), the translation of (11a), a declarative sentence with a direct evidential:

$$(12) \quad c_0[(11b)] = \{w \in c_0 \mid \exists g \exists p \in D_{st}(\llbracket \lambda v_0.(11b) \rrbracket^{\mathcal{M},g}(w) = \{p\})\} \\ = \{w \in c_0 \mid \llbracket \text{CRT} \rrbracket^{\mathcal{M}}(w)(\llbracket i \rrbracket^{\mathcal{M}})(\llbracket \lambda w.\text{sang}(w, \text{floyd}) \rrbracket^{\mathcal{M}}) = 1\} \\ = c_1$$

Interpreted in context  $c_0$ , Definition 1 applied to (11b) returns  $c_1$ , the restriction of  $c_0$  to worlds where the speaker is certain (based on personal experience) that Floyd sang.<sup>8</sup>

The illocutionary relation structures the restricted common ground. This relation on the common ground can be defined by binding both  $v_0$  and  $v_1$ :

**Definition 2** (Illocutionary Relation). For a common ground  $c$ , worlds  $w, w'$  in  $c$ , a model  $\mathcal{M}$ , and an  $(st)t$  term  $P$ ,  $w'$  is  $P, c$ -related to  $w$ , written  $w' \mathcal{R}_{c,P} w$ ,<sup>9</sup> iff:

$$w, w' \in c \ \& \ \llbracket \lambda v_0.\lambda v_1.P \rrbracket^{\mathcal{M}}(w)(w') \neq \emptyset$$

The nature of the illocutionary relation depends on the morpheme that contributes it. In the examples, I replace  $\mathcal{R}$  with the symbol for an ordering relation ( $\geq$ ) or an equivalence relation ( $\equiv$ ), depending on the properties of the relation.<sup>10</sup> For example, Definition 2 applied to (11b) yields an ordering relation ( $\geq_{c_1,(11b)}$ ), given in (13). The input common ground  $c_1$  is the restricted common ground defined in (12).

$$(13) \quad w' \geq_{c_1,(11b)} w \quad \text{iff} \quad w, w' \in c_1 \ \& \ \llbracket \lambda v_0.\lambda v_1.(11b) \rrbracket^{\mathcal{M}}(w)(w') \neq \emptyset \\ \text{iff} \quad w, w' \in c_1 \ \& \ \llbracket \lambda w.\text{sang}(w, \text{floyd}) \rrbracket^{\mathcal{M}}(w) \\ \leq \llbracket \lambda w.\text{sang}(w, \text{floyd}) \rrbracket^{\mathcal{M}}(w')$$

The ordering relation in (13) ranks worlds in  $c_1$  where Floyd sang over worlds in  $c_1$  where Floyd did not sing. This ordering represents the proposal to add the proposition that Floyd sang to the common ground  $c_1$ . If this proposal is accepted,  $c_1$  will be further restricted to the top-ranked worlds, the worlds where Floyd sang.

The translations of the other Cheyenne sentences have structures similar to (11b). Declarative sentences with other evidentials have the same at-issue proposition but both the evidential restriction and the illocutionary relation differ. For example, consider the translation in (14b) of (7), a declarative sentence with a reportative evidential.

<sup>8</sup>In this definition, the final conjunct of (11b),  $p(v_0) \leq p(v_1)$ , which specifies the content of the illocutionary relation, contributes a trivial requirement and can be eliminated.

<sup>9</sup>These subscripts do not directly correspond to the ones in the diagrams in Sections 3 and 4, which indicate what the relation informally depends on (the at-issue proposition or the input context alone).

<sup>10</sup>I use the symbol ' $\leq$ ' for a relation that is reflexive, transitive, and antisymmetric (ordering relation) and the symbol ' $\equiv$ ' for a relation that is reflexive, transitive, and symmetric (equivalence relation).

- (14) a. (7) 3-sing-RPT Floyd  
 b.  $\lambda p. (p = \lambda w. \text{sang}(w, \text{floyd})) \wedge \text{HRD}(v_0, i, p) \wedge v_1 = v_1$

Like in (11b), the at-issue proposition in (14b) is the proposition that Floyd sang. In (14b), the evidential restriction is to worlds where the speaker heard that Floyd sang. The illocutionary relation is a trivial identity relation, which results in an equivalence relation that ranks all  $c_1$  worlds together as an equivalence class. This relation represents the fact that there is no proposal to add the at-issue proposition to the common ground. However, this implementation does not capture the intuition that the at-issue proposition is ‘presented’ (Faller 2002). In an implementation of this proposal in a dynamic framework with propositional discourse referents (e.g., Stone 1999, Brasoveanu 2007, Bittner 2008), this intuition could be formalized as the introduction of a discourse referent for the at-issue proposition.

Following Hamblin’s (1973) analysis of English interrogatives, I analyze Cheyenne interrogatives as denoting potentially non-singleton sets of proposition. They are translated with the same three components as declarative sentences: an identification condition, an evidential restriction, and an illocutionary relation. For example, consider the translation (15b) of (8), an interrogative formed with the clitic  $m\acute{o} =$  (‘y/n=’).

- (15) a. (8) y/n=3-sing-RPT Floyd  
 b.  $\lambda p. (p = \lambda w. \text{sang}(w, \text{floyd}) \vee p = \lambda w. \neg \text{sang}(w, \text{floyd}))$   
 $\wedge \text{HRD}(v_0, u, p) \wedge p(v_0) = p(v_1)$

Unlike the declarative sentences, the identification condition of interrogatives will admit more than one proposition. The set characterized by (15b) can contain both the proposition that Floyd sang and the proposition that Floyd did not sing – the at-issue content of the answers to (15a). The evidential restriction in (15b) is contributed by the reportative evidential; it is the same as in (14b) but is anchored to the addressee  $u$ . It restricts the common ground to worlds where the addressee  $u$  has reportative evidence for her answer, whatever that answer is. However, question (15a) is only felicitous in such contexts, so this restriction is trivial. Definition 1 applied to (15b) yields (16).

$$(16) \quad c_0[(15b)] = \{w \in c_0 \mid \exists g \exists p \in D_{st} (\llbracket \lambda v_0. (15b) \rrbracket^{\mathcal{M}, g}(w) = \{p\})\}$$

$$= \{w \in c_0 \mid \llbracket \text{HRD} \rrbracket^{\mathcal{M}}(w)(\llbracket u \rrbracket^{\mathcal{M}})(\llbracket \lambda w. \text{sang}(w, \text{floyd}) \rrbracket^{\mathcal{M}}) = 1$$

$$\vee \llbracket \text{HRD} \rrbracket^{\mathcal{M}}(w)(\llbracket u \rrbracket^{\mathcal{M}})(\llbracket \lambda w. \neg \text{sang}(w, \text{floyd}) \rrbracket^{\mathcal{M}}) = 1\}$$

$$= c_0$$

The evidential restriction of (15b) is a presupposition in the sense of Stalnaker (1973); it is entailed by the input common ground. Yet, the proposed translations do not represent the difference between a presupposition and an assertion. For example, there is no indication in (15b) that the evidential restriction is a presupposition. However, an implementation of the current proposal in an existing dynamic theory of presupposition (e.g., van der Sandt 1992, Beaver 2001) could represent this distinction.

Definition 2 applied to (15b) returns the relation in (17).

$$(17) \quad w' \equiv_{c_0, (15b)} w \quad \text{iff} \quad w, w' \in c_0 \ \& \ \llbracket \lambda v_0. \lambda v_1. (15b) \rrbracket^{\mathcal{M}(w)}(w') \neq \emptyset$$

$$\quad \text{iff} \quad w, w' \in c_0 \ \& \ \llbracket \lambda w. \text{sang}(w, \text{floyd}) \rrbracket^{\mathcal{M}(w)}$$

$$\quad \quad \quad = \llbracket \lambda w. \text{sang}(w, \text{floyd}) \rrbracket^{\mathcal{M}(w')}$$

The illocutionary relation in (17) is an equivalence relation, following Groenendijk and Stokhof (1984). It partitions worlds in the input common ground  $c_0$  into two cells: worlds where Floyd sang and worlds where Floyd did not sing. This analysis of Cheyenne questions merges two approaches to the semantics of questions, typically seen as competitors: questions as sets of answers (Hamblin 1973) and questions as partitions (Groenendijk and Stokhof 1984). Both innovations are used, and both are needed: the set of propositions specifies what is at issue and allows the addressee to bear the evidential relation to either answer. The equivalence relation structures the common ground, representing the proposal to either add  $p$  or to add  $\neg p$  to the common ground (see also Groenendijk 2009).

Interrogatives formed with the illocutionary mood suffix *-he* ('-Y/N') are analyzed as having the same identification conditions and illocutionary relation as interrogatives formed with *mó=*. However, *-he* interrogatives contribute a different evidential restriction. For example, the translation of (9) is given in (18b).

$$(18) \quad \text{a.} \quad (9) \text{ 3-sing-Y/N Floyd}$$

$$\quad \text{b.} \quad \lambda p. (p = \lambda w. \text{sang}(w, \text{floyd}) \vee p = \lambda w. \neg \text{sang}(w, \text{floyd}))$$

$$\quad \quad \quad \wedge R_{EVI}(v_0, u, p) \wedge p(v_0) = p(v_1)$$

The illocutionary relation in (18b) is an equivalence relation like in (15b): it partitions the worlds in the common ground into two cells: worlds where Floyd sang and worlds where Floyd did not sing. The evidential restriction in (18) is a variable over evidential predicates,  $R_{EVI}(v_0, u, p)$ , representing the fact that *-he* questions can be answered by any evidential.<sup>11</sup>

## 6. Towards Semantic Composition

The proposed translations of Cheyenne sentences with evidentials can be derived compositionally by using the meaning assignments given in (19).

(19) Translations: Cheyenne into Ty <sub>2</sub>		
<u>Cheyenne</u>	<u>Ty<sub>2</sub>-translation</u>	<u>Type</u>
3-	z	<i>e</i>
Floyd	floyd	<i>e</i>
sing	$\lambda y. \lambda w. \text{sang}(w, y)$	<i>est</i>
-DIR	$\lambda q. \lambda p. (p = q) \wedge CRT(v_0, i, p) \wedge p(v_0) \leq p(v_1)$	<i>(st)(st)t</i>
-RPT	$\lambda q. \lambda p. (p = q) \wedge HRD(v_0, i, p) \wedge v_1 = v_1$	<i>(st)(st)t</i>
-Y/N	$\lambda q. \lambda p. (p = q \vee p = \lambda w. \neg q(w)) \wedge R_{EVI}(v_0, u, p) \wedge p(v_0) = p(v_1)$	<i>(st)(st)t</i>

<sup>11</sup>Alternatively, the variable over evidential restrictions  $R_{EVI}(v_0, u, p)$  could be left out of the translation of (9). This may be desirable given the goal of extending the proposed analysis to other illocutionary moods, which may not contribute an evidential restriction. However, it would complicate the answerhood relation and would treat Cheyenne *-he* questions like basic English yes/no questions.

For example, consider Cheyenne (20), which is example (7) without the proper name.<sup>12</sup>

- (20)  $\acute{E}$ -nemene-séstse  
 3-sing-RPT.3SG  $\rightsquigarrow$   $\lambda p. (p = \lambda w. \text{sang}(w, z)) \wedge \text{HRD}(v_0, i, p) \wedge v_1 = v_1$   
 ‘He<sub>z</sub> sang, I hear’

The derivation of (20) from the meaning assignments in (19) is given in (21).

- (21)
- $$\begin{array}{c}
 \text{(20) 3-sing-RPT} \\
 \lambda p. (p = \lambda w. \text{sang}(w, z)) \wedge \text{HRD}(v_0, i, p) \wedge v_1 = v_1 \\
 \swarrow \quad \searrow \\
 \begin{array}{cc}
 \text{3-sing} & \text{-RPT} \\
 \lambda w. \text{sang}(w, z) & \lambda q. \lambda p. (p = q) \wedge \text{HRD}(v_0, i, p) \wedge v_1 = v_1 \\
 \swarrow \quad \searrow & \\
 \begin{array}{cc}
 \text{3-} & \text{sing} \\
 z & \lambda y. \lambda w. \text{sang}(w, y)
 \end{array}
 \end{array}
 \end{array}$$

The reportative attaches high in the tree, after the at-issue proposition has been constructed, and maps the at-issue proposition to a set of propositions that satisfy the additional conditions. The other evidentials and the illocutionary mood markers, including the yes/no interrogative (-Y/N), would occupy the same place in a derivation as the reportative in (21).

No translation for the clitic  $m\acute{o}=\mathring{}$  is given in (19), and it may not be possible to derive (15b) compositionally within this system. Unlike the evidentials and illocutionary mood markers, the interrogative clitic  $m\acute{o}=\mathring{}$  must be a modifier of type  $((st)t)(st)t$ . It combines with a declarative sentence of type  $(st)t$  to form a question of type  $(st)t$ . The desired translation of  $m\acute{o}=\mathring{}$  would combine with (20) to form (22). An initially plausible meaning for  $m\acute{o}=\mathring{}$  is given in (23).

- (22)  $\lambda p. (p = \lambda w. \text{sang}(w, z) \vee p = \lambda w. \neg \text{sang}(w, z)) \wedge \text{HRD}(v_0, u, p) \wedge p(v_0) = p(v_1)$

- (23)  $y/n=\rightsquigarrow \lambda Q. \lambda p. Q(p) \vee Q(\lambda w. \neg p(w)) \wedge p(v_0) = p(v_1)$

However, the translation in (23) is unsuccessful on several fronts. When applied to (20), the result is (24), not the desired (22).

- (24)  $\lambda p. (p = \lambda w. \text{sang}(w, z) \vee p = \lambda w. \neg \text{sang}(w, z))$   
 $\wedge \text{HRD}(v_0, i, \lambda w. \text{sang}(w, z)) \wedge v_1 = v_1 \wedge p(v_0) = p(v_1)$

<sup>12</sup>The addition of a name requires a variable binding rule along the lines of the ‘Rule B’ of Bittner (1994), a lambda abstraction rule for resolving type mismatch. This rule would be used to bind the free variable  $z$  in (20). The resulting expression, a function of type  $e(st)t$ , would be combined with floyd (type  $e$ ).

In (24) the evidential restriction is incorrectly anchored to *i*: it should be anchored to *u*, the addressee, as in (22). Correcting this requires positing an otherwise unmotivated lexical ambiguity: two entries for each evidential, one anchored to *i* for declaratives, as in (19), and one anchored to *u* for interrogatives. Second, the propositional argument of the evidential restriction in (24) is incorrect: it is fixed to  $\lambda w.\text{sing}(w, z)$ , but it should vary with *p*, as in (22). Lastly, the illocutionary relation contributed by  $m\acute{o}=\text{}$  does not modify the one contributed by the evidential, it adds to it, resulting in two relations (or two constraints on the same relation). This is unproblematic in (24) because the relation contributed by the reportative is trivial. But, what about  $m\acute{o}=\text{}$  questions containing other evidentials? Consider (25), which is (23) applied to the translation of ‘3-sing-DIR’ ((11) without the proper name).

$$(25) \quad \lambda p. (p = \lambda w.\text{sing}(w, z) \vee p = \lambda w.\neg\text{sing}(w, z)) \\ \wedge \text{CRT}(v_0, i, \lambda w.\text{sing}(w, z)) \wedge p(v_0) \leq p(v_1) \wedge p(v_0) = p(v_1)$$

The illocutionary relation contributed by  $m\acute{o}=\text{}$  ( $p(v_0) = p(v_1)$ ) is stricter than the one contributed by the direct evidential ( $p(v_0) \leq p(v_1)$ ), so the later does no harm in this case, even though in general it is not a trivial condition. While this double specification of the illocutionary relation seems unproblematic in the discussed cases, it is potentially troublesome and worth taking note of.

The discussed difficulties in translating  $m\acute{o}=\text{}$  are an artifact of the formal implementation of the proposal given in this paper. A fully compositional analysis may be possible in a different framework, such as a dynamic system with both individual and propositional discourse referents (e.g., Brasoveanu 2007, Bittner 2008, Stone 1999). In addition, such a framework could account for the propositional anaphora in the challengeability examples, which the current implementation cannot account for.

## 7. Conclusions

In Cheyenne, evidentials and the yes/no interrogative mood marker belong to the same illocutionary mood paradigm. The presented analysis treats the morphemes in this paradigm as a natural semantic class. They are analyzed as grammatically encoding a distinction between what is at-issue and what is not. This distinction is modeled as the difference between restricting the common ground (with the evidential restriction) and structuring it (with the illocutionary relation).

The evidential restriction in declarative sentences amounts to an assertion about the type of evidence the speaker has for the scope proposition. This new information is not-at-issue, non-negotiable, and is added directly to the common ground. The evidential restriction in interrogative sentences amounts to a presupposition about the type of evidence the addressee of the question has for her answer. This not-at-issue information must be entailed by the input common ground. The evidential restriction accounts for the difference in felicitous answers for the two types of yes/no interrogatives: *-he* questions, which can be answered with any evidential, and  $m\acute{o}=\text{}$  questions, which restricts answers to ones containing the evidential from question.

The proposed analysis is compositional (like Hamblin 1973), with the exception of the translation of  $m\acute{o}=\text{}$ , and it distinguishes the evidential and propositional contributions without positing a separate level of illocutionary meaning (contra Faller 2002). Furthermore, it accounts for the intuitions that the information contributed by the evidential in declarative sentences is new, not presupposed (contra Izvorski 1997, Matthewson et al. 2008), and that both contributions affect the truth conditions (contra Faller 2002).

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