Mapping opposite truth-values: a semantics for Blackfoot *noohk-*[1]

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The Blackfoot morpheme *noohk-* has a variety of different interpretations in different contexts. I give an analysis of its semantics such that its variety in meaning follows from a lexical entry which makes reference to both i) an ordering source and ii) a commitment set. As semantic contexts vary with respect to the ordering source they employ, and the individual whose commitments are relevant, the meaning of *noohk-* likewise varies.

1   Introduction

The Blackfoot (Plains Algonquian) morpheme *noohk-* has a variety of different interpretations in different contexts. I propose that *noohk-*'s variation in meaning can be accounted for with a single lexical entry, where its core meaning indicates an opposition in truth-values with respect to whether the core proposition holds in the actual world, w_0, and whether it holds in all of the worlds w', which are highest ranked by a given ordering source. The key to the analysis is that because ordering sources vary across utterances, the semantic contribution of *noohk-* likewise varies.

This paper is organised as follows: In section two, I give data illustrating five different interpretations associated with *noohk-*. In section three I give an informal analysis for *noohk-* and show how it can derive four of the five relevant interpretations. I attempt to formalize this in section four, making use of commitment sets (cf. Gunlogson 2001) parameterized to illocutionary mode and ordering sources parameterized to individuals. In section five I address the fifth reading associated with *noohk-* and consider how the formalization given in section four might account for it. I conclude in section six.

2   Illustrative data

Frantz & Russell (1995) gloss the morpheme *noohk-* as "counter-expectation" or "please". While *noohk-* does have these interpretations, there are at least three other systematic interpretations that it can take on. In this section, I provide data illustrating all of *noohk-*'s readings; the table in (1) previews these various interpretations.

(1)

Context	Semantic Contribution of *noohk-*
Ability (*ohkott-*) Declaratives	Counter-expectation
Bare Future (*áak-*) Declaratives	"Should"
Progressive Future (*áyaak-*) Declaratives	"Was supposed to"
Imperatives (*-t*)	Politeness/ "please"
Additive VP-focus (*matt-*) Declaratives	Additive subject-focus

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2.1   Counter-expectation with the ability modal *ohkott-*

The minimal pair in (2) shows that *noohk-*'s contribution to declaratives marked with the ability modal *ohkott-* is one of counter-expectation. (2a), marked with the ability modal *ohkott-*, is an ability attribution, an assertion that the speaker was able to climb the Grouse Grind. The addition of *noohk-,* as in (2b), yields the additional sense that the asserted truth-value of the proposition was unexpected, or counter to one's expectations. This is indicated by the consultant's comments; the addition of *noohk-* is akin to telling someone that the speaker was able to climb the mountain, in spite of the fact that he/she has arthritis.

(2)   **Context**: Talking about climbing the Grouse Grind, a steep hiking trail on Grouse Mountain.

  a.   nít<u>ohkott</u>aamisáátoo'p   omi mistaaki
      nit-<u>ohkott</u>-waamisaatoo-'p omi mistaaki
      1-<u>able</u>-ascend-loc>0   dem mountain
       'I was able to climb that mountain.'

  b.   ni**nóóhk**<u>ohkott</u>aamisáátoo'p   omi mistaaki
      ni-**noohk**-<u>ohkott</u>-waamisaatoo-'p omi mistaaki
      1-**c.exp**-<u>able</u>-ascend-loc>0   dem mountain
      'I was able to climb that mountain.'   (BB: 2010-04-16)
      BB: Like telling someone **in spite of my arthritis**, I was able to climb that mountain.

The minimal pair in (3) shows a similar effect. (3a) is an ability attribution, indicating that the speaker's son is able to dance. The addition of *noohk-* as in (3b) requires a context where the truth of the ability attribution is unexpected or in doubt.

(3) a.   <u>áóhkott</u>sspiyi
      á-<u>ohkott</u>-ihpiyi
      impf-<u>able</u>-dance.vai
      'He can dance.'

  b.   **noohk**á<u>óhkott</u>sspiyi
      noohk-á-<u>ohkott</u>-ihpiyi
      c.exp-impf-<u>able</u>-dance.vai
      '*Yeah*, he can dance.'   (BB: 2010-03-24)
      BB: Let's say there are two rivals, and one woman's son dances, she's bragging like her son is the only one that dances. She just takes it for granted that the son of the woman next to her doesn't dance. She asks the other, "Does your son dance?," the other woman can reply: "*Aa, noohkáóhkottsspiyi*"- "*Yeah*, he is able to dance."

2.2   "Should" with the bare future morpheme *áak-*

The minimal pair in (4) shows *noohk-*'s meaning contribution to declaratives marked with the bare future morpheme *áak-*. (4a) is a declarative marked with the bare future morpheme *áak-*; it is interpreted as a basic future declarative "She will eat." The minimal addition of *noohk-,* as in (4b), shifts the meaning of the utterance so that it is interpreted with a sense of weak necessity, being translated as "She should eat."

(4) a.   <u>áák</u>soyiwa
      <u>áák</u>-ooyi-wa
      <u>fut</u>-eat.vai-3
      'She will eat.'   (Frantz & Russell 1989:134)

b. <u>áak**óóhk**</u>soyiwa
<u>áák</u>-**noohk**-ooyi-wa
<u>fut</u>-**c.exp**-eat.vai-3
'She should eat (assuming she has not been eating).'   (Frantz & Russell 1989:106)

The data in (5) and (6) are additional cases showing this systematic shift in meaning.

(5)   <u>áák**oohk**</u>simi   áóhkii
        <u>áák</u>-**noohk**-simi   aohkii
        <u>fut</u>-c.exp-drink.vai   water
        'He should have drank some water.'   (BB: 2009-02-10)

(6)   kamákitapooyiniki   omááhkoyissi,   kit<u>áák**oohk**</u>itapawaani
        kam-<u>áák</u>-itap-oo-iniki   omaahk-oyiss-yi   kit-<u>áák</u>-**noohk**-itap-awaani
        if-fut-toward-go-sbj   big-tipi-0   2-<u>fut</u>-**c.exp**-toward-fly.vrt
        'If you're going to Edmonton, you should fly.'   (BB: 2010-03-24)

2.3   "Was supposed to" with the progressive future morpheme *áyaak-*

The minimal pair in (7) shows *noohk-*'s effect on declaratives marked with the progressive future morpheme *áyaak-*. (7a), marked with the progressive future morpheme *áyaak-,* is interpreted as "He's going to go away." The addition of *noohk-*, as in (7b), shifts the meaning of the utterance so that it is interpreted with a past-shifted weak necessity reading, being translated as "He was supposed to go away."

(7) a. <u>áyaak</u>istapoo
        <u>áyaak</u>-mistap-oo-wa
        <u>pfut</u>-away-go.vai-3
        'He's going to go away.'

   b. **noohk**<u>áyaak</u>istapoo
        noohk-<u>áyaak</u>-mistap-oo-wa
        c.exp-<u>pfut</u>-away-go.vai-3
        'He was supposed to go away.'   (BB:2008-01-11)

The data in (8)-(10) provide additional instances of this meaning shift.

(8)   nikáákattáíhpiyi   ni**nóóhk**<u>ayáák</u>stsisoo
        n-ikak-matt-á-ihpiyi   ni-**noohk**-<u>áyaak</u>-istsisoo
        1-only-add-impf-dance.vai   1-**c.exp**-pfut-go.to.town.vai
        'I'm just dancing around, I **was supposed to** go to town.'   (BB:2010-01-27)

(9)   **nóóhk**<u>ayaak</u>omatapáásai'nih
        noohk-<u>áyaak</u>-omatap-waasai'ni
        c.exp-p<u>fut</u>-start-cry.vai
        'She **was supposed to** start crying.'   (BB:2008-01-15)

(10) also shows that the "was supposed to p" reading entails that relevant proposition, p, does not hold.

(10)   **nóóhk**<u>ayaak</u>saysoota,   ki   #máátsootawaatsiks
        noohk-<u>áyaak</u>-sa-sootaa   ki   máát-sootaa-waatsiksi
        c.exp-<u>pfut</u>-neg-rain.vai   and   neg-rain.vai-3:nonaff.sg
        'It **wasn't supposed to** rain, and #it didn't rain.'   (BB: 2008-11-09)

2.4   Politeness in imperatives

The minimal pair in (11) shows *noohk-*'s semantic contribution to imperatives. (11a) is a simple imperative, translated as "Dance!". The addition of *noohk-* as in (11b) lends a sense of politeness, being translated as either "Please dance!" or "Why don't you dance?".

(11) a. ííhpiyííṯ!
         ihpiyi-ṯ
         dance-2s(impv)
         'Dance!'   (BB:2010-02-08)

     b. **nóóhk**ihpiyiiṯ!
         noohk-ihpiyi-ṯ
         c.exp-dance.vai-2s(impv)
         'Why don't you dance?'
         BB: Like in a nice way   (BB:2010-02-08)

The data in (12) and (13) are additional cases of this politeness reading.

(12) **noohk**sowáttsspiyit!
      noohk-sa-matt-ihpiyi-t
      c.exp-neg-add-dance.vai-2s(impv)
      'Please don't dance anymore!'   (BB:2009-04-06)

(13) aná   **noohk**sspommos!
      ana   **noohk**-sspomo-s
      dem   c.exp-help.vta-2s>3(impv)
      'Please help him!'   (BB:2006-10-18)

2.4   Additive subject-focus with the additive VP-focus marker *matt-*

The final reading is illustrated by the minimal pair in (14). (14a) is a declarative marked with the additive morpheme *matt-*, which most commonly yields an additive VP-focus reading (cf. Louie 2011). (14a), translated as "I also run," is thus felicitous in a context where the speaker is listing various activities he or she participates in, eg. " I run, in addition to swimming." The minimal addition of *noohk-* as in (14b) shifts the meaning of the utterance so that focus is interpreted as if it is on the subject. Thus, (14b), translated as "I run *also*", is used in a context where the speaker is not the only runner, eg. "I run, in addition to *you* running."

(14) a. ni**matt**áókska'si
         ni-**matt**-á-okska'si
         1-**add**-impf-run.vai
         'I also run' (eg. in addition to swimming)
         BB: Telling someone what you do   (BB:2010-01-27)

     b. ni**noohk**attáókska'si
         ni-**noohk**-matt-á-okska'si
         1-**c.exp**-add-impf-run.vai
         'I run *also*.'
         BB: If he's a runner too, the person that you're taking to (BB:2010-01-27)

This concludes the illustrative data. Next I show how an informal semantics for *noohk-* can derive the first four of the five readings associated with *noohk-*.

3 Proposal: a mapping of opposite truth-values

I propose that the basic semantic contribution of *noohk-* is to mark an opposition in truth-values for the core proposition, p, with respect to whether it holds in the actual world w_0, versus whether it holds in all of the worlds, w', that are highest ranked by a salient ordering source. If the speaker is linguistically committed to the fact that p holds in w_0, then *noohk-* maps the opposite truth-value for p, i.e., that p is false, onto all of the highest ranked worlds w'. Conversely, if the speaker is committed to the fact that p does not hold in w_0, then *noohk-* maps the opposite truth-value for p, i.e., that p is true, onto all of the highest ranked worlds w'. This can be implemented as follows:

1. Let α be a target-language proposition corresponding to *noohk-*'s prejacent.

    I intend this expression α to corresponds to the utterance minus the contribution of *noohk-* .For example, in the case of ability declaratives, α corresponds to *ohkott*-p (able-p); in the case of the future declaratives, α corresponds to *áak*-p (will-p) and *áyaak*-p (be-going-to-p), etc.[2]

2. Let H be the set of worlds, w', that are highest ranked according to an ordering source associated with α .

    i.e., H={w': $\neg\exists$w"[w">$_{OS}$ w']}, where >$_{OS}$ is derived from an ordering source associated with α

3. If α commits the speaker, S, to the truth of the core proposition, p, in the world of utterance w_0, at the time of utterance, t_0, then *noohk-α*

    i) commits the speaker to $p(w_0)(t_0)=1$, and
    ii) presupposes that for all w'∈H, $p(w')(t_0)=0$

4. If, on the other hand α does not commit the speaker, S, to the truth of the core proposition, p, in the world of utterance w_0, at the time of utterance, t_0, then *noohk-α*

    i) commits the speaker to $p(w_0)(t_0)=0$, and
    ii) presupposes that for all w'∈H, $p(w')(t_0)=1$

As *noohk-*'s prejacent, α, can vary according to both its ordering source, and whether or not it commits the speaker to the truth of the core proposition, the semantic contribution of *noohk-* varies accordingly. I will illustrate how the proposed implementation can derive the relevant readings in the following subsections.

Something to note before proceeding is that Blackfoot does not overtly mark tense – i.e., a imperfective-marked eventive can be interpreted as either past or present (cf. Dunham 2007, Ritter & Wiltschko 2009). Eventives unmarked with the imperfective aspect are always interpreted as past perfective, however (cf. Reis Silva & Matthewson 2007). I will assume that this past interpretation follows from the "default" perfective aspect – i.e., that whereas a perfective eventive can be interpreted as past, since the past tense is an interval which can contain the event, a perfective eventive cannot be interpreted as present, since the present tense is an instant that is too small to do so. In what follows, then, when considering whether the speaker is committed to whether p holds at t_0, I mean p to be interpreted by default as perfective (and therefore past).

3.1 Counter-expectation with the ability modal *ohkott-* (α = *ohkott*-p, *able*-p)

Ability attributions are standardly treated as instances of circumstantial modality (cf. Kratzer

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2 Although I am referring to this element *α* as *noohk-*'s prejacent, this is only for expository ease. It is in fact misleading as I ultimately do not assume that *noohk-* applies directly to *α*. In section 4 I propose a syntactic structure where *noohk-* first combines with a propositional operator that introduces the ordering source (eg, *ohkott-*, *áak-*, *áyaak-)*, and this complex takes the core proposition as an argument, yielding as output the propositional operator applied to the proposition – i.e., what I refer to here as *α*.

1991). Following this standard view, the relevant ordering source associated with circumstantial modals is a stereotypical one, such that worlds are ordered according to how consistent they are with the normal course of events, or how well they follow reasonable expectations. This means that our set of highest-ranked worlds, H, in ability attributions, will correspond to the set of worlds that are maximally consistent with the normal course of events.

Next consider whether an ability attribution, α, commits the speaker to the truth of the proposition it modifies. Bhatt (1999) and Hacquard (2006) note that cross-linguistically, ability attributions in the perfective aspect often do commit the speaker to the truth of the proposition the ability modal modifies – i.e., that perfective ability attributions are associated with actuality entailments. Davis et al (2010) show that *ohkott-* ability attributions in Blackfoot are accompanied by an actuality entailment regardless of aspect[3]. This is shown in (15), where an *ohkott-*marked utterance is infelicitous in a context where the speaker knows that the proposition that *ohkott-* modifies is false. This is true for both imperfective (15a) and perfective (15b). To remove the actuality entailment, the utterance must be additionally modified by future marking as in (15c).

(15)   **Context**: There's a mountain in Squamish with a hiking trail called The Chief. It's not very steep, so even I, with my mediocre exercise and eating habits, managed to climb it. My friend Abigail, who exercises a lot and eats well, could definitely climb it. Yesterday she had a free day, so she could have gone and climbed it, but she didn't.

   a.   #á**óhkott**aamisáátoomayi
        á-**ohkott**-waamisaatoo-m-ayi
        impf-**able**-climb.vti-3>0-dtp
        (Target: She could have climbed it)

   b.   #**iihkott**aamisáátoomayi
        ii-**ohkott**-waamisaatoo-m-ayi
        ic-**able**-climb.vti-3>0-dtp
        (Target: She could have climbed it)

        BB: She has to have climbed it before - we have to be sure. For both *íihkottaamisáátomayi* and *áóhkottaamisáátomayi*, you have to have climbed it before. Like you see it with your own eyes, then you know she can do it.

   c.   áak**ohkott**aamisáátoomayi
        áak-**ohkott**-waamisaatoom-ayi
        fut-**able**-climb.bti-3>0-dtp
        'She can climb it.'   (BB: 2009-01-15)

Thus in ability attributions, *noohk-*'s prejacent, α, commits the speaker to the truth of the core proposition, in the world of utterance, at the time of utterance. According to the implementation outlined above, this means that *noohk-α* will

   i)   commit the speaker to the truth of p, in w_0, at the time of utterance, and

   ii) presuppose p is false in all of the worlds in H, i.e., all the worlds that are maximally consistent with the normal course of events (i.e., the most likely worlds).

If p is false in all of the most likely worlds, this suggests that the truth of p is unlikely, despite the fact it holds. In other words, the contribution of *noohk-,* in ability attributions, is to indicate that p is unlikely, or counter to one's expectations[4].

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3 Unless *ohkott-* is embedded under another modal element, like a conditional or future.
4 See Copley 2005 for an analysis of a Tohono O'odham modal *cem*, which is similar to the analysis here. Copley

3.2   Future expressions

In this section I will address *noohk-*'s contribution to future-marked declaratives. Before doing so, however, I will lay out some background information on the semantics of futures in Blackfoot.

Blackfoot has two future morphemes *áak-* and *áyaak-,* which Reis Silva (2008) analyses as analogous to the English future constructions *will* and *be going to,* as analysed in Copley (2002, 2009). Copley argues that future expressions can vary according to two dimensions: First, future expressions can vary according to the properties of the "director," where a "director" is an entity whose commitments determine what happens in the future. For our purposes here, we will equate the "director" with the subject of the sentences. The second way that future expressions can vary is according to their aspectual specifications. Future expressions can be either aspectually bare (devoid of aspectual specification), or aspectually progressive[5]. It is this second difference that will be relevant for the analysis that follows.

I will adopt a simplified semantics for progressive operators such that where bare (non-progressively-marked) predicates need only hold for the reference time, t, progressively-marked predicates must hold for an interval of time containing the reference time, t'. This is illustrated in (16).

(16) a. **Bare**   ----------------[-t-]---------------

   b. **Progressive**:   t'

                               ----------[-----[-t-]------]--------

Assuming that futures are modals, we can then follow Copley in analysing future expressions as universal quantifiers over worlds, where the relevant worlds are ordered according to how consistent they are with respect to the director's commitments. Taking aspect into account, we can conceptualize bare futures like *áak-* and *will* as ordering worlds according to the director's commitments at the reference time t. Progressive futures like *áyaak-* and *be going to,* on the other hand, order worlds according to the director's commitments for a time interval containing the reference time, t'.

With this basic semantics for Blackfoot future morphemes *áak-* and *áyaak-*, we can now consider how they will interact with the proposed semantics for *noohk-*.

3.2.1   "Should p" with the bare future *áak-* (α = *áak-* p, *will*-p)

In the case of bare future declaratives, the relevant ordering source is such that it orders worlds according to how consistent they are with the subject's commitments at a reference time, t. I will assume that this is taken to be, by default, the utterance time, t_0. The set of highest-ranked worlds, H, then, consists of the worlds where the subject fulfils as many of their commitments as possible.

Note that unlike the previous case where α corresponded to an ability attribution, a future declarative α does not commit the speaker to the truth of the proposition in w_0, at the time of utterance, t_0. According to the implementation outlined above, this means that *noohk-*α will

   i)   commit the speaker to the falsity of p, in w_0, at the time of utterance, and

   ii)   indicate p is true in all of the worlds in H, i.e., all the worlds that are maximally consistent with the subject's commitments at t_0.

If p is true in all of the worlds where the subject fulfils as many of their commitments as possible, this suggests that realizing p is a top-commitment of the subject, at the time of utterance, despite the fact that p does not hold at t_0. This derives the "should" reading associated with *noohk-* in bare future declaratives

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proposes that *cem* presupposes that all inertial worlds are worlds where p is realized, and asserts that the actual world is not an inertia world.

5 Copley also includes a generic aspect; I abstract away from this as it will not be relevant for the analysis.

– the subject has a commitment to realize p, and has not yet done so, thus the subject *should* realize p[6].

3.2.2 "Was supposed to p" with the progressive future *áyaak-* (α = *áyaak-* p, *going-to*-p)

The progressive future case with *áyaak* is analogous to the bare-future cases with *áák* , except that the subject's commitments must hold for t', a larger interval of time which contains t_0. This means p must have been a top-commitment for the subject, for the period of time directly preceding t, as illustrated in (17).

(17)

This means that *noohk-* indicates that realizing p was a top-commitment of the subject, despite the fact that p does not hold at at t_0. This derives the past-shifted "was supposed to" interpretation that *noohk-* yields in progressive future declaratives – the subject was *supposed to* have realized p, as it was a past-commitment they did not fulfil. As for present and future-oriented readings, I suggest that these readings are blocked by the availability of the previous cases – i.e., the bare future "should" cases.

3.3 Politeness with the imperative (α = p!)

Finally consider imperatives. Unlike the previous declarative cases, imperatives do not commit the speaker to the truth of a proposition. Rather, they commit the Addressee to making the proposition come true. I formalize this in terms of Portner (2004, 2007)'s To-Do-List.

Portner (2004) introduces the To-Do-List for imperatives as a formal counterpart to what the Common Ground is for declaratives. Whereas declaratives that are accepted in conversation are put into the Common Ground, a set of propositions that are mutually assumed to be true by the interlocuters (Stalnaker 1974, 1978), imperatives that are accepted in conversation are put into the Addressee's To-Do-List, a set of propositions that the interlocuters mutually assume to be commitments of the Addressee[7]. The To-Do-List imposes an order on the worlds compatible with the Common Ground (according to how consistent they are with the commitments in the To-Do-List), and Portner (2007) proposes that To-Do-Lists subdivide into (at least) three subparts: i) orders, ii) invitations and iii) suggestions. These correspond, respectively, with i) deontic (requirement-oriented), ii) bouletic (desire-oriented) and iii) teleological (goal-oriented) ordering sources.

For the analysis that follows, I assume that the Blackfoot imperatives under question are invitations, and thus associated with a bouletic ordering source[8]. This means that the worlds in the

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6When I say that this "derives the "should" reading," I mean that an English translation with *should* best approximates the meaning of a Blackfoot *aak-noohk*-p utterance. I do not mean to claim that English *should* expressions have the semantics outlined above. The same holds for the "supposed to" reading. I suggest that the English translation with *supposed to* best approximates the Blackfoot meaning, but do not claim that the English *supposed to* construction has the semantics sketched above.

7 Portner actually formalizes the Addressee's To-Do-List as a set of properties which the interlocutors mutually assume the Addressee will try to bring about to be true of him/herself. I abstract away from this for simplicity.

8 Bare imperatives are at least not orders. Forceful commands in Blackfoot, which would have a deontic ordering source, require the preverbal morpheme *stam-*, as shown below:

(i)　　　stamihpiyiit*!*
　　　　　stam-ihpiyi-t
　　　　　just-dance.vai-2s(impv)
　　　　　'Dance!'
　　　　　BB: You're demanding someone to dance - "Just go out there and dance!"

Further research is required on *stam-*, which can also be used to express counter-expectation, in bare declaratives, where it is often translated as "just," or as is common in narratives, not translated at all. Frantz & Russell (1995) gloss it as "just/unqualifiedly," "genuinely,"and "despite." Bare imperatives could very well be suggestions, however, and associated with a teleological ordering source. This is a question for further research.

Common Ground are ordered according to how consistent they are with the Addressee's desires, and that H, the set of highest-ranked worlds, is the set of worlds that are maximally consistent with the Addressee's desires.

The imperative prejacent, commits the Addressee to making the proposition p true. Viewing this as analogous with the Speaker being committed to the truth of p, then according to the implementation outlined above, *noohk-α* will

    i)   commit the Addressee to making p true, and

    ii) indicate p is false in all of the worlds in H, i.e., all the worlds that are maximally consistent with the Addressee's desires at t_0.

If p is false in the Addressee's topmost desires worlds, this suggests that p is not a topmost desire of the Addressee. Note that this can be interpreted in two ways. Either p can be only somewhat desirable, or p can be downright undesirable. In the former case, we can derive the "why don't you p" translations associated with *noohk-*. In these cases, the addition of *noohk-* is an acknowledgement that while p may not be among the Addressee's topmost desires, it may nonetheless be a pleasant outcome. In the latter case, where p is downright undesirable, we can derive the "please p" translations. Here, the addition of *noohk-* can be viewed as an acknowledgement that realizing p is an inconvenience for the Addressee[9].

4   Formalization: a provisional lexical entry for *noohk-*

In this section I attempt to formalize the implementation given above in section 3. Because the implementation relies on the notion of speaker commitment, instead of using the notion of Common Ground for declaratives/assertions, I will use the notion of a Commitment Set, as in Gunlogson 2001. This notion of commitment set will be laid out in section 4.1. In section 4.2 I provide a provisional lexical entry for *noohk-*. In section 4.3 I consider some formal aspects of the proposed lexical entry and make the observation that *noohk-* tends to target elements that are parameterized to individuals.

4.1   Interlocuter commitments and commitment sets (Gunlogson 2001)

As the notion of Common Ground (CG) relies on the *mutual* beliefs of the interlocutors, Gunlogson (2001) proposes a more articulated notion of the CG, dividing it into two sets of propositions, DC_A and DC_B. DC_A and DC_B correspond to each interlocutor, A and B, and consist of the relevant interlocutor's public beliefs, or discourse commitments. Each set of propositions can further define a set of worlds, $\cap DC$, which corresponds to the set of worlds where each proposition that the interlocutor is publicly committed to being true is true. This set of worlds is termed a commitment set, cs, as per (18)[10].

(18)   Commitment sets (Gunlogson 2001)

    Let a discourse context $C_{\{A,B\}}$ be $<cs_A, cs_B>$, where:
     A and B are the discourse participants

    a. cs_A of $C_{\{A,B\}}$ = {w∈W: the propositions representing A's public beliefs are all true of w}

    b. cs_B of $C_{\{A,B\}}$ = {w∈W: the propositions representing B's public beliefs are all true of w}

We can think of a cs as the set of worlds that, for a declarative, the asserted proposition is intersected with, such that the resulting set of worlds is the speaker's new commitment set.

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9 Matthewson (2009) has a somewhat similar analysis for the St'át'imcets subjunctive, however her subjunctive imperatives are relativized to the Speaker, as opposed to the Addressee.
10 This is parallel to Stalnaker's notion of the context set, $\cap CG$, the set of worlds where all of the propositions mutually held to be true by the interlocuters are true.

Because the analysis considered here deals with imperatives as well as declaratives, I will use a version of Gunlogson's commitment sets where commitment sets are parameterized not only to the speech act participants, but also to illocutionary mode. Declarative propositions, as above, intersect with a commitment set derived from DC_x, where x ranges over the interlocuters (A and B), being ultimately assigned to the Speaker at t_0. Imperative propositions, however, intersect with a commitment set derived from T_x, where T_x stands for x's To-Do-List, and x is ultimately assigned to the Addressee at t_0. This is formally summarized in (19):

(19)   Revised commitment sets (relativized to illocutionary mode)

      Let $cs_m = \{w | w \in \cap m\}$, the set of worlds that p is intersected with,
         where   m, for illocutionary mode, is a variable that ranges over sets of propositions, and
                 x is a variable that ranges over the discourse participants,
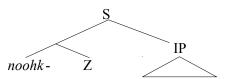
    a. In declaratives, $m = DC_x$, x=Speaker
          where $DC_x = \{p_{<s,t>} |$ x is publicly committed to the truth of p$\}$

    b. In imperatives, $m = T_x$, x=Addressee
          where $T_x = \{p_{<s,t>} |$ x is publicly committed to realizing p$\}$

With this notion of a parameterized commitment set, we can propose a rough lexical for entry for *noohk-*.

4.2   A lexical entry for *noohk-*

    I will assume a syntactic structure where *noohk-* combines directly with the element from which it derives the ordering source. That is, *noohk-* combines first with *ohkott-* (able), *áak-* (will), *áyaak-* (be going to), and the imperative *-t*[11], and the resulting complex then merges with the phrase-structure[12]. This is schematized in in (20), where Z stands in for *ohkott-*, *áak-*, *áyaak-*, etc.

(20)

With this type of structure, I propose the denotation in (21):

(21) $[\![$*noohk-*$]\!]^{CSm, t} = \lambda Z.\lambda p.\ \exists X \exists Y[X,Y \in \{cs_m, h'(Z)\}]\ \&\ [\forall w \in X \rightarrow w \in p(t)]\ \&[\forall w \in Y \rightarrow w \notin p(t)].\ Z(p)$

    Where $Z \in \{$*áak-*, *áyaak-*, *ohkott-*, *-t*$_{IMPV}...\}$,
               t is the reference time (t_0 by default),
               h' is a function that applies to Z, yielding H, the set of highest-ranked worlds[13], and
               $H = \{w': \neg\exists w''[w'' >_{OS} w']\}$, where $>_{OS}$ is derived from an ordering source associated with Z.

The denotation in (21), as per the structure in (20), has *noohk-* taking a propositional operator, Z, eg. *áak-*, *áyaak-*, *ohkott-*, *-t*$_{IMPV}$, as its sister, and a proposition p as its arguments. It then yields as its output, the propositional operator Z applied to p. This corresponds to what, in section 3, I was referring to as α, *noohk-*'s prejacent. The denotation also contains a presupposition which commits the speaker to saying that for the sets of worlds, cs_m and H,

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11 The morphological form of imperatives in Blackfoot actually varies according to the transitivity of the predicate, and the person/number of the theme nominal. I abstract away from this here.
12 Thanks to Aynat Rubinstein for helping me out of a compositional problem by pointing out that *noohk-* could combine first with a Z element, the resulting complex then combining with the proposition.
13 I address this function, h', more in section 4.3.

i) one of these sets, X, is such that p holds as true for all of its members at time t, and
ii) the other set, Y, is such that p holds as false for all of its members at time t.

Because the output yields an expression corresponding to α, the interpretation of α can then be used to resolve which set, cs_m or H, corresponds to the set of p worlds (X), or the set of ¬p worlds (Y). If α commits the speaker to the truth of p, then cs_m must be equated with with X, leaving H to be the set of ¬p worlds, Y. If, on the other hand, α does not commit the speaker to the truth of p, then cs_m is equated with with Y, leaving H to be the set of p worlds, X^{14}.

4.3   The function h'

An obvious question that arises given the provisional lexical entry above is as follows: what is this function h' such that it applies to the relevant elements of Z (*áak-*, *áyaak-*, *ohkott-*, *-t...*), and yields the set of highest-ranked worlds H? Recall that H, the set of highest ranked worlds, was previously defined as follows: {w': ¬∃w"[w">$_{OS}$ w']}, where >$_{OS}$ is derived from an ordering source associated with Z. The most obvious route would to assume that h' simply takes the ordering source from the Z element, and then yields the set {w': ¬∃w"[w">$_{OS}$ w']}. In order to determine the relevant properties of h', however, we should take a closer look at the semantics of *áak-*, *áyaak-*, *ohkott-*, and *-t*.

4.3.1   The future modals *áak-* and *áyaak-*

Recall that Copley (2002, 2009)'s semantic characterization of future expressions crucially relies on the notion of a director – an entity whose commitments determine what happens in the future – where, for our purposes, the director was taken to be the subject. Copley suggests that there is evidence for the director being represented in the syntax, and I will follow this, assuming that future modals project raising structures as in (22)[15]. Future modals thus take a proposition as their argument, then abstract over the proposition's subject argument so that it can raise and be interpreted as the "director" whose commitments are relevant for the future expression's meaning.

(22)   [Amelia   [will λ₁   [t₁ dance]]]

Following Copley's characterization of future expressions as modals with metaphysical modal bases[16] and director-oriented ordering sources, we can posit denotations for *áak-* and *áyaak-* as in (23): the modal base, f, yields the set of metaphysically accessible worlds from the evaluation world, w^{17}. The ordering source, g, then further restricts these worlds to those which are most consistent with the commitments of the subject, x, at time t or t' (for *áak-* and *áyaak-* respectively). It is then stated that for all of these worlds, w', p is realized by x in w', at some time t", which follows the reference time t.

(23)   Future Modals *áak-* and *áyaak-*

a.   ⟦áak-⟧^{f,g,t} = λp. λx. λw: f is a metaphysical cb,
            g is such that g(w)={p: p expresses a commitment of x_i in w at t}.
            ∀w'∈ best$_{g(w)}$(∩f(w) [λy. ∃t" [t" > t] & ⟦p⟧$^{g(i→y)}$(x)(w')(t")]

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14 The reader may be worried that a future expression does not necessarily commit the speaker to the falsity of p at t_0. English future expressions, for example, merely implicate this, but do not entail it. This is not the case for Blackfoot, however, where a future-marked expression is infelicitous if p holds at t_0 (A. Reis Silva p.c.)

15 I will abstract away from whether this should be a control vs raising structure (cf. Hackl 1998), as I don't believe it is immediately relevant for the analysis at hand. The relevant observation is that the expressions in question require an individual for their interpretation.

16 The worlds metaphysically accessible from w at time t are those worlds that are identical to w up to time t, in a branching worlds framework.

17 Technically, f(w) yields a set of propositions, here, the set of propositions metaphysically accessible from w, and the intersection of these propositions, ∩f(w), is the modal base.

b. $[\![\text{áyaak-}]\!]^{f,g,t}$ = λp. λx. λw: f is a metaphysical cb,

g is such that g(w)={p: p expresses a commitment of x_i in w at t'}.

∀w'∈ $\text{best}_{g(w)}$(∩f(w) [λy. ∃t'' [t'' > t] & $[\![p]\!]^{g(i\longrightarrow y)}$(x)(w')(t'')]

(Where x_i is the subject of the *áak-/áyaak-*'s proposition argument,

and x_i raises to satisfy *áak-/áyaak-*'s individual argument.)

4.3.2 The ability modal *ohkott-*

I will likewise assume that ability modals, like futures, project raising structures as in (24) (cf. Hackl 1998).

(24)   [Amelia   [can λ₁   [t₁ dance]]]

Motivation for such a structure can be constructed in parallel to that of the future expressions: ability modals, being a subset of circumstantial modals, are interpreted relative to the circumstances/abilities of an argument of the ability modal's prejacent. That is, if I say "Amelia can dance," I am making a statement based on Amelia's internal and external circumstances. Ability modals can thus be viewed as parallel to future expressions: they take a proposition and abstract over an argument of the proposition, x, so that x raises, and that x's abilities/circumstances can be used to interpret the ability attribution. The ability modal *ohkott-*, then, can be given a lexical entry as in (25):

(25) $[\![\text{ohkott-}]\!]^{f,g}$ = λp. λx. λw: g is a stereotypical cb,

f_x = {p: realizing p is compatible with x_i's circumstances in w}.

∃w'∈ $\text{best}_{g(w)}$(∩f(w) [λy.$[\![p]\!]^{g(i\longrightarrow y)}$(x)(w')]

(Where x_i is an argument of *ohkott-*'s proposition argument,

and x_i raises to satisfy *ohkott-*'s individual argument.)

The reader may recall that *ohkott-* is associated with an actuality entailment. I have abstracted away from this aspect of its meaning in (25), as it is not directly relevant for the point being made here[18]. The important thing to note here is that, as is the case with future expressions, the meaning of *ohkott-* is parameterized to an individual. Whereas the parameterization for future expressions is localized to the ordering source, g, however, the parameterization for ability attributions is localized to the modal base, f.

4.3.3 Imperative *-t*

As for imperatives, I will propose the denotation in (26). This is adapted and simplified from Portner (2004, 2007)[19].

(26) $[\![\text{IMPV}]\!]^{w,g,t}$ = λp. λx. λw: x is the addressee$_C$ and p∈g, where

g=bouletic$_x$={p: p expresses a desire of x in w at t}.

[λy.$[\![p]\!]^{g(i\longrightarrow y)}$(x)(w)]

As with the previous elements. the imperative is parameterized to an individual, specifically, the

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18 Reis Silva (2009) analyses the actuality entailment as a conventional implicature.

19 Although I will put a disclaimer here stating that I have not, in any careful way, investigated the semantics of imperative constructions in Blackfoot. This is an area for further research. The denotation differs from Portner's in that i) I have directly encoded the type of ordering source, ii) I left out his parameterized selection functions for simplicity, and iii) I have vacuously abstracted over the subject/addressee so that the imperative, like the other elements in Z, can be seen as taking a proposition and individual argument (as opposed to Portner's original formulation, where the imperative takes a property and an individual argument).

Addressee. I would like to suggest that this parameterization is not a coincidence, but rather is hardwired into the function h'. In other words, h' does not simply take the ordering source, the function g, from the relevant modal/imperative morpheme, in order to define a set of highest-ranked worlds, H, as in (27a). Rather h' requires a set of propositions that has been parameterized to an individual. Because the individual parameterization associated with ability attributions is localized to the modal base, and not the ordering source, this means that h' must take the set of propositions that was yielded by the (parameterized) circumstantial modal base and further restricted by the ordering source. Thus the set of worlds H, might more properly be defined as in (27b). In section 5 I will point out that such a formalization can better account for *noohk*-'s interaction with the additive focus morpheme *matt-*[20]. I leave a full formalization of h', however, for further research.

(27) a. $H = \{w' : \neg \exists w''[\ w'' \leq_{g(w)} w']\}$

   b. $H = \{w' \in \text{best}_{g(w)}(\cap f(w)) : \neg \exists w''[\ w'' \leq_{g(w)} w']\}$
   (where f corresponds to the modal base for modals, but to the To-Do-List for imperatives)

5   The fifth reading: focus shifting with additive focus marker *matt-*

In this section I address the fifth reading reading associated with *noohk-;* the data from (14) is repeated here for convenience. (14a), marked with the additive particle *matt-,* is interpreted with additive VP-focus. (14b), which minimally differs from (14a) with the addition of *noohk-*, is interpreted with additive subject-focus.

(14)
   a. nimattáókska'si
       ni-matt-á-okska'si
       1-add-impf-run.vai
       'I also run' (eg. in addition to swimming)
       BB: Telling someone what you do   (BB:2010-01-27)

   b. ni**noohk**attáókska'si
       ni-**noohk**-matt-á-okska'si
       1-**c.exp**-add-impf-run.vai
       'I run also.'
       BB: If he's a runner too, the person that you're taking to   (BB:2010-01-27)

By focus, I refer to the semantic notion of making reference to a set of alternatives derived from the asserted proposition. This set of alternative propositions (the p-set) has the property such that every proposition matches the asserted proposition, except with respect to a specific locus of variation. This locus of variation is termed the "focus." Thus whereas the relevant set of alternatives in (14a) differ according to denotation of the VP (i.e, run vs swim), and is thus a VP-focus reading, the relevant set of in alternatives (14b) vary according to the denotation of the subject (i.e., Speaker vs Addressee), and is a subject-focus reading. The question to ask at this point is why the addition of *noohk-* in additive-focus marked constructions would force a subject-focus interpretation. I suggest that this is because the semantics of h' (and therefore *noohk-)* requires access to a set of propositions parameterized to an individual, and that while a subject-focus p-set can satisfy this requirement, a VP-focus p-set cannot.

First consider the meaning of the additive morpheme *matt-*. I will assume that *matt-* is a truth-conditionally vacuous element that introduces a set of propositions, E, and presupposes that a member of E, in addition to the asserted proposition, is true (cf. Kartunnen & Peters 1979, Rooth 1992, see Louie

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20 Notice that the function h' appears quite similar to Portner (2007)'s parameterized selection functions, although it is localized in a different component of the grammar (as Portner's selection functions are more fully integrated into the meaning of imperatives and modals themselves, as opposed to how I have used h' in an morpheme that interacts with these elements).

2011[21]). In default cases, this set of propositions E is resolved as a focus p-set. Consider now the set of propositions associated with a subject and VP-focus set respectively:

(28) Amelia runs

    a. E = {Amelia runs, Heather runs, Meagan runs...}   Subject-Focus p-set
           ={p: p= λw. x runs in w | x$\in$D$_e$}

    b. E = {Amelia runs, Amelia dances, Amelia rides her bike...}   VP-Focus p-set
           ={p: p= λw. P(Amelia) in w | P$\in$D$_{<e,t>}$}

The observation is this: while the subject-focus p-set is parameterized to an individual (the subject), a VP-focus p-set is not[22]. Thus while a subject-focus p-set can be taken by h' in order to interpret the *noohk*-marked utterance, a VP-focus p-set cannot. The addition of *noohk*- with VP-focus will therefore be uninterpretable, deriving the strict subject-focus reading associated with *noohk*-.

    Before concluding, however, we should consider what the actual contribution of *noohk*- will do to a *matt*-marked expression. Because a *matt*-p expression commits the speaker to the truth of the proposition, p, a *noohk-matt-p* expression must

    i) commit the speaker to p=1, and
    ii) indicate that p=0 in all H, the set of highest-ranked worlds

Note that this means H cannot be interpreted as the intersection of the focus p-set, as the focus p-set necessarily contains the prejacent proposition p – i.e., because the intersection of the focus p-set is the set of worlds where all the propositions in the p-set are true, this would require that p is true in all H. In order to avoid contradiction, then, the focus p-set must be analogous to the set of propositions represented by f(w) and the To-Do-List in the previous cases, and this set will then be further restricted by a salient ordering source. This ordering source is then used to derive H. I will assume that in non-modal declaratives, the ordering source is stereotypical, such that worlds are ordered according to how consistent they are with the normal course of events. Evidence for this comes from the fact that while *noohk*- is not very productive with bare declaratives, when it is possible, *noohk*- yields a counter-expectation reading similar to that seen in ability attributions. This is shown in (29). While the bare declarative in (29a) is translated as either "I have money" or "It's mine", the addition of *noohk*- as in (29b) is translated as either "Yes, I *do* have money" or "It *does* belong to me." Here, we can understand the phonological prominence on the do-auxiliaries in as marking verum-focus, such that the truth of the asserted proposition is the opposite of what we might have expected it to be.

(29)
    a. *nitsíínaani*
       nit-ii-inaani
       1-ic-have.something.vai
       'I have money/It's mine'   (BB:2010-02-08)

    b. *ni**nóóhk**sinaani*
       ni-**noohk**-inaani
       1-**c.exp**-have.something.vai
       i) 'Yes, I *do* have money.'   (BB:2010-02-08)
       ii) 'It *does* belong to me.'

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21 In Louie 2011, I propose that *matt*- introduces a set of situations, as opposed to a set of propositions. I assume it introduces a set of propositions here for simplicity. The relevant set of propositions can be derived from the set of situations, I suggest, in terms of exemplification (cf. Kratzer 2009).
22 It is rather parameterized to predicates of type <e,t>.

We thus expect that the addition of *noohk-* in *matt*-marked declaratives to likewise yield a sense of counter-expectation. I suggest that this is quite compatible with the contrastive nature of focus-marked expressions.

6   Conclusion and unresolved issues

To summarize, I have proposed that the variety of interpretations associated with the Blackfoot morpheme *noohk-* is compatible with a single lexical entry. More specifically, I proposed that the basic semantic function of of *noohk-* is to mark an opposition in truth-values for the prejacent proposition, p, with respect to whether it holds in:

    i)   all the worlds in cs_m, the set of worlds consistent with the commitments of an interlocutor, vs
   ii)   all the worlds in H, the set of worlds highest-ranked according to a given ordering source.

Because semantic contexts vary with respect to i) whose commitment set the proposition, p, is intersected with (Speaker or Addressee), and ii) the relevant ordering source, the meaning contribution of *noohk-* likewise varies in a predictable way. In formalizing the semantics of *noohk-*, I made use of Gunlogson's (2001) notion of an articulated Common Ground, modified such that commitment sets are parameterized to illocutionary mode. I also suggested that *noohk-* specifically targets semantic contexts associated with a set of propositions that is parameterized to an individual, where this range of contexts included future constructions, ability attributions, imperatives and subject-focus expressions.

This investigation into *noohk-* has suggested a unified semantics for a seemingly polysemous morpheme in Blackfoot, however, it also raises some interesting questions regarding the type-theoretic representation of modals, imperatives and focus markers in Blackfoot. If, as is common, we assume a type-driven semantics, the fact that *noohk-* applies to all of these creatures suggests that the modals in question (futures *áak-* and *áyaak-*, ability *ohkott-*), the imperative morpheme *(-t)*, and the additive focus marker *matt-,* are all of the same semantic type. This is not unproblematic; while modals are generally modelled as propositional operators, as I have represented them here, Portner (2007), for example, models imperatives as operating on properties, not propositions. While I have represented the Blackfoot imperative morpheme as a propositional operator and vacuously abstracted over the subject position in order to maintain a parallel type between the modals and the imperative, there is little independent motivation for such a move. This issue of semantic type becomes even more problematic when considering the additive marker *matt-*. Recall that I have represented the elements to which *noohk-* applies as propositional operators that are crucially parameterized to an individual argument extracted from the propositional argument. As such, I have represented them as elements of type $<<s,t>,<e<s,t>>>$ - i.e., elements that take a proposition, and an individual, and yield a proposition. Such a type, however, is only plausible for the additive marker *matt-* when marks additive subject-focus. In such cases, the individual argument of *matt-* would force raising/abstraction over the subject individual argument, which could be used to derive the relevant alternatives. In cases where *matt-* marks VP-focus, however, the relevant alternatives would have to be derived by raising/abstracting over the property denoted by the VP. If the abstraction in the subject-focus cases is encoded in terms of *matt-*'s semantic type, then this would require *matt-* in VP-focus cases to have a different semantic type than *matt-* does in subject-focus cases. This is obviously undesirable, as it would require that there are two (and probably more) *matt-* morphemes, with different semantic types, but suspiciously similar additive meanings. Or even more implausibly, that there is a single additive *matt-* morpheme, but that the locus of focus can affect its semantic type. As these are both undesirable moves, it seems that in order to maintain a type-driven semantics, the individual parameterization associated with modals, imperatives and (in subject-focus cases) the additive morpheme *matt-* should not be represented in terms of type/arguments. But then how should it be encoded?

References

Bhatt, R. 1999. "Actuality Entailments of Ability Modals." Proceedings of the 17th West Coast
    Conference on Formal Linguistics, Palo Alto, CA, CSLI}, pp. 74-87.

Copley, B. 2009. *The semantics of the future*. Routledge.

Copley, B. 2002. *The semantics of the future*. Ph.D Thesis. MIT.

Davis, H, M. Louie, L. Matthewson, I. Paul, A. Reis Silva and T. Peterson. 2010. "Perfective   Aspect and Actuality Entailments: A Cross-Linguistic Approach." In Suzi Lima (ed.), UMOP 41: *The Proceedings of SULA V: The Semantics of Under-Represented Languages in the Americas*. Amherst, MA: GLSA.

Dunham, J. 2007. The "Durative" in Blackfoot: Understanding Imperfectivity. 2007. In Amy Rose Deal (ed.), *Proceedings of SULA 4: Semantics of Under- Represented Languages in the Americas.* University of Massachusetts Occasional Papers in Linguistics 35, 49-6

Frantz, D. G. 2009. *Blackfoot grammar*. Second Edition: University of Toronto Press.

Frantz, D. G, and N. J Russell.1995. *Blackfoot dictionary of stems, roots, and affixes*. University of Toronto Press.

Gunlogson, C. 2001. "True to Form: Rising and Declarative as Questions in English." Ph.D. Dissertation. UC Santa Cruz.

Hackl, M. 1998. "On the semantics of ability attributions." Ms. MIT.

Hacquard, V. 2006. "Aspects of Modality." Ph.D. Thesis. MIT.

Kartunnen, L. and Peters, S. 1979. "Conventional Implicature." *Syntax and Semantics* 11:1-56.

Kratzer, A. 1991. "Modality." in A. von Stechow and D. Wunderlich (eds.) An International Handbook of Contemporary Research, 639-650. Berlin de Gruyter.

Kratzer, A. 2009. "Situations in natural language semantics." *Stanford encyclopedia of philosophy.*

Louie, M. 2011. "Deriving Full Repetition in Blackfoot with Additive Focus." In N. Li & D. Lutz (eds.), Proceedings of Semantics and Linguistic Theory 20. pp. 1-18, Cornell University Linguistics Department: CLC Publications.

Matthewson, L. 2009. "The semantics of the St'át'imcets subjunctive." Ms.

Portner, P. 2004. The semantics of imperatives within a theory of clause types. In K. Watanabe & R.B. Young (eds.), *Proceedings of Semantics and Linguistic Theory* 14. Cornell University Linguistics Department: CLC Publications.

Portner, P. 2007. "Imperatives and modals." *Natural Language Semantics* 15(4):351–383.

Reis Silva, A. 2008. "Future Modality in Blackfoot." Qualifying Paper, UBC.

Reis Silva, A. 2009. "Circumstantial Modality and Actuality Entailments in Blackfoot." Proceedings of Chronos 2009.

Rooth, M. 1992. "A Theory of Focus Interpretation."NLS 1:75-116.

Rubinstein, A. In Prep.

Stalnaker, R. 1978. Assertion. In P. Cole (ed.) *Pragmatics: Syntax and Semantics 9.* New York: Academic Press.

Stalnaker, R. 1974. Pragmatic presupposition. In M. Munitz & P. Unger (eds.), *Semantics and philosophy*, 197-213. New York: New York University Press.

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