Proceedings of SULA7 (Cornell 2012), ed. Hannah Green

Perspectival discourse referents for indexicals*

Maria Bittner

Rutgers University

By definition, the reference of an indexical depends on the context of utterance. For example, the proposition expressed by *I am hungry* depends on who says this and when. Since Kaplan (1979), context dependence has been analyzed in terms of two parameters: an *utterance context*, which determines the reference of indexicals, and a formally unrelated *assignment function*, which determines the reference of anaphors (represented as variables). This STATIC VIEW of indexicals, as pure context dependence, is still widely accepted. With varying details, it is implemented by current theories of indexicality not only in static frameworks, which ignore context change (e.g. Schlenker 2003, Anand and Nevins 2004), but also in the dynamic framework of DRT. In DRT, context change is only relevant for anaphors, which refer to current values of variables. In contrast, indexicals refer to static contextual anchors (see e.g. Kamp 1985, Zeevat 1999). This SEMI-STATIC VIEW reconstructs the traditional indexical-anaphor dichotomy in DRT.

An alternative DYNAMIC VIEW of indexicality is implicit in the 'commonplace effect' of Stalnaker (1978) and is formally implemented in Bittner (2007, 2011). The basic idea is that indexical reference is a species of discourse reference, just like anaphora. In particular, both varieties of discourse reference involve not only context dependence, but also context change. The act of speaking up focuses attention and thereby makes this very speech act available for discourse reference by indexicals. Mentioning something likewise focuses attention, making the mentioned entity available for subsequent discourse reference by anaphors. On this dynamic view, both indexicals and anaphors refer to discourse referents made salient by prior updates.

This paper argues for the dynamic view based on empirical evidence from Kalaallisut (Eskimo-Aleut: Greenland) and Slavé (Athabaskan: Northern Canada). In Kalaallisut, grammatical centering treats indexical persons as 'inherent topics' (Section 1). This is a mystery on the static view, but is expected on the dynamic view (Sections 2–4). In Slavé, certain attitude verbs allow certain indexicals to take the perspective of the atti-

* I am grateful Theodore Fernald, Sarah Murray, and the audience at SULA7 for comments and questions, and to my Kalaallisut consultants, for help with Kalaallisut data. Any errors are my own.

tude holder instead of the speaker (Rice 1986). On the dynamic view, this is due to *de se* readings, where the Slavé verb introduces the current state of the attitude holder as the central perspectival discourse referent for shiftable indexicals in its scope (Section 5).

1. Anaphora and indexicality: Kalaallisut evidence

In Kalaallisut, nouns and verbs inflect for pronominal arguments. Specifically, intransitive verbs inflect for subjects; transitive verbs, for subjects and objects; and relational nouns, for possessors. In Kalaallisut discourse the pronominal argument inflection is typically the only overt expression of the subject, object, or possessor. Overt syntactic noun phrases are relatively rare. In Bittner (2011) these patterns are taken at face value and analyzed in a directly compositional way, without positing any covert English-style pronouns. The basic idea is that Kalaallisut is a pronominal argument language in the sense of Jelinek (1984). That is, the base of a Kalaallisut verb or noun is interpreted as a predicate whose nominal arguments are semantically saturated by pronominal argument inflections. Syntactic noun phrases, when present, are adjoined dependents licensed by pronominal argument inflections. The semantic effect of a left-adjoined noun phrase is to set the antecedent for the anaphoric argument inflection that licenses this adjunct. Subject and object inflections also license right-adjoined noun phrases, which semantically elaborate the referent of the inflection (see Categorial Grammar fragment in Bittner 2011).

In Kalaallisut discourse, pronominal argument inflections are part of a grammatical centering system that keeps track of the currently most salient individuals in the center of attention (TOPIC, $\top$) and in the background (BACKGROUND, $\bot$). This centering system consists of obligatory inflectional marking for pronominal arguments as well as mood. Specifically, *third person* argument inflections come in two forms. The $\top$-form refers to the currently topical third person, i.e. the most salient individual in the center of attention (e.g. *-ni* '$3\text{SG}_{\top}$'). In contrast, the $\bot$-form refers to the most salient third person individual in the background (e.g. *-a(t)* '$3\text{SG}_{\bot}$'). In addition, matrix verbs inflect for *illocutionary mood*, which relates the illocutionary force of the speech act to the currently topical individual. In this paper, we will only be concerned with the declarative mood, whose form depends on the transitivity of the base predicate (see (M)). Finally, the matrix verb can be modified by one or more verbs in *dependent moods* (see (M′)). Semantically, left-adjoined dependent verbs set the context for interpreting the matrix verb, whereas right-adjoined dependent verbs take narrower scope and/or elaborate the matrix:

(M)	-pu	'$\text{DEC}_{\top}$'				assertion of main fact about $\top$
	-pa	'$\text{DEC}_{\top\bot}$'				assertion of main fact about $\langle \top, \bot \rangle$
(M′)	-ga	'$\text{FCT}_{\top}$'	vs.	-mm	'$\text{FCT}_{\bot}$'	background fact about $\top$ vs. $\bot$
	-gu	'$\text{HYP}_{\top}$'	vs.	-pp	'$\text{HYP}_{\bot}$'	topical hypothesis about $\top$ vs. $\bot$
	-gaanga	'$\text{HAB}_{\top}$'	vs.	-gaang	'$\text{HAB}_{\bot}$'	topical habit of $\top$ vs. $\bot$
	-llu	'$\text{ELA}_{\top}$'	vs.	-tu	'$\text{ELA}_{\bot}$'	elaboration of $\top$ vs. $\bot$

For example, consider discourse (1i–iv) below. Sentence (1i) begins with a topic-setting noun, which introduces a topical group of kids. The subsequent verbs first elabo-

rate this topic (ELA$_{\top}$) and then assert the main fact about it (DEC$_{\top}$). Next, the attention shifts to Ole and his friend. Either one can be introduced as the new topic ($^{\top}$), while the other one is introduced into the background ($^{\perp}$), as the variants (1ii) and (1ii′) illustrate. Anaphora resolution in the matrix, which asserts the main fact about the current topic (DEC$_{\top}$), varies accordingly. In the context of (1i), either variant, (1ii) or (1ii′), is coherent.

However, only variant (1ii) can then be coherently followed by further recentering in (1iii), where Ole is promoted to topical status, while another friend is introduced into the background (by 'Ole-ERG$^{\top}$ [friend-3SG$_{\top}$.ERG other.3SG$_{\perp}$]$^{\perp}$…FCT$_{\perp}$-3SG$_{\perp}$'). This recentering makes no sense if Ole already has topical status in the input, as he does after variant (1ii′). In the coherent discourse (1i, ii, iii), the initial clause of (1iii), which updates both the topic and the background and presents a background fact about the latter (FCT$_{\perp}$), is followed by an assertion of the main fact relating these two individuals (DEC$_{\top\perp}$)—i.e. the current topic (Ole) in relation to the current background (Ole's other friend, who lost).

Finally, in sentence (1iv), the repetition of the predicate from (1iii) ('console-try') with nominalizing re-centering morphology ('-obj-3SG$_{\perp}$.$^{\top}$') signals a switch in the relative prominence of these two individuals. The consoling agent, Ole, is demoted to background status ($\perp$-form of the possessor inflection, '-3SG$_{\perp}$'), while the spotlight shifts to the unhappy friend who is the object of Ole's sympathy ('-obj-…$^{\top}$').

(1) i. Ippassaq atuartut qimusserlutik sukkanniupput.
ippassaq atuartut qimussir-llu-tik sukkanniut-pu-t
yesterday school.kids$^{\top}$ drive.dog.sled-ELA$_{\top}$-3PL$_{\top}$ race.e.o-DEC$_{\top}$-3PL
'Yesterday the school kids$^{\top}$ had a dogsled race.'

ii. Olep ikinngutaa ajugaagami nuannaarpoq.
Ole-p ikinngut-a ajugaa-ga-mi nuannaar-pu-q
[Ole-ERG$^{\perp}$ friend-3SG$_{\perp}$]$^{\top}$ win-FCT$_{\top}$-3SG$_{\top}$ happy-DEC$_{\top}$-3SG
'Ole$^{\perp}$'s friend$^{\top}$ won, so he$_{\top}$ (= the friend) was happy.'

ii′. Olep ikinngunni ajugaammat nuannaarpoq.
Ole-p ikinngut-ni ajugaa-mm-at nuannaar-pu-q
[Ole-ERG$^{\top}$ friend-3SG$_{\top}$]$^{\perp}$ win-FCT$_{\perp}$-3SG$_{\perp}$ happy-DEC$_{\top}$-3SG
'Ole$^{\top}$'s friend$^{\perp}$ won, so he$_{\top}$ (= Ole) was happy.'

iii. Olep ikinngummi aappaa ajorsarmat
Ole-p ikinngut-mi aappa-a ajursar-mm-at
Ole-ERG$^{\top}$ [friend-3SG$_{\top}$.ERG$^{\perp}$ other.3SG$_{\perp}$.$^{\perp}$] lose-FCT$_{\perp}$-3SG$_{\perp}$
tuppallersarniaraluarpaa.
tuppallirsar-niar-galuar-pa-a
console-try-in.vain-DEC$_{\top\perp}$-3SG.3SG
'Ole$^{\top}$ tried to console his$_{\top}$ other friend$^{\perp}$, who$_{\perp}$ had lost.' (✓(ii–iii), #(ii′–iii))

iv. Tuppallersarniagaali tusarumanagu qiajuaannarpoq.
Tuppallirsar-niar-ga-a=li tusar-uma-na-gu qia-juaannar-pu-q
console-try-obj-3SG$_{\perp}$.$^{\top}$=but listen-want-not.ELA$_{\top}$-3SG$_{\perp}$ cry-keep.on-DEC$_{\top}$-3SG
'But [the object of his$^{\perp}$ sympathy]$^{\top}$, $_{\top}$refusing listen to him$_{\perp}$, kept on crying.'

Discourse (1i, ii, iii, iv) illustrates how the grammatical centering system of Kalaallisut keeps track of the currently *topical third person individual* (⊤) and the contrasting *background third person individual* (⊥) in discourse. In particular, this centering system renders third person anaphora unambiguous. Turning now to indexical persons—i.e., first and second—what we find is that their centering status is 'inherently topical'.

The centering status of indexical persons is not indicated by the form of the person inflection, because only third person inflections have contrasting ⊤- vs. ⊥-forms. The third vs. non-third person asymmetry is typical of grammatical obviation systems, which the Kalaallisut system instantiates. However, the Kalaallisut system is redundant, because the centering status of the dependent subject also marked by the ⊤- vs. ⊥-form of dependent mood (see (M′) and mood marking in (1i–iv)). The dependent mood marking extends to indexical persons, and that is what reveals their status as 'inherent topics'.

For example, the third person subject inflection of a dependent verb requires the ⊤- or ⊥-form of the dependent mood inflection, depending on whether the matrix subject inflection, which always refers to the current topic, is anaphoric to or disjoint from the dependent subject (e.g. compare (1ii) vs. (1ii′)). Not so for indexical subject inflections. As inherent topics, these always select the ⊤-form of the dependent mood inflection, regardless of the matrix topic (e.g. in (2a) and (2b) alike). This generalization holds for all dependent moods (FCT, HYP, HAB, ELA) and all indexical persons (1SG, 2SG, 1PL, 2PL). Indeed, except for the non-finite elaborating mood, combinations of the ⊥-form of a dependent mood with an indexical subject are ungrammatical (e.g. *(2c)).

OBSERVATION 1: Indexical persons select the ⊤-form of dependent mood (see (2))

(2) a. Ajugaagama nuannaarpunga. ✓(a) for FCT/HYP/HAB/ELA-
ajugaa-ga-ma nuannaar-pu-nga -1SG/2SG/1PL/2PL
win-FCT$_{\top}$-1SG happy-DEC$_{\top}$-1SG
I won, so I was happy.

b. Ajugaagama Ole nuannaarpoq. ✓(b) for FCT/HYP/HAB/ELA-
ajugaa-ga-ma Ole nuannaar-pu-q. -1SG/2SG/1PL/2PL
win-FCT$_{\top}$-1SG Ole$^{\top}$ happy-DEC$_{\top}$-3SG
I won, so Ole$^{\top}$ was happy.

c.* Ajugaamma *(c) for FCT/HYP/HAB-
Ajugaa-mm-ma … -1SG/2SG/1PL/2PL
win-FCT$_{\perp}$-1SG …

Another manifestation of the inherently topical status of indexical persons is that, unlike third persons, they do not compete for topical status. That third persons do compete for topical status is shown by the marking of transitive verbs (tv). For third person arguments, either the subject or the object can be marked as the current topic, but not both (e.g. ✓(3a, b) vs. *(3c)). This generalization holds unless one of the arguments is indexical. As an *inherent* topic, the indexical argument does not compete, so topical status can be assigned to a third person co-argument without incurring ungrammaticality (e.g. compare *(3c) vs. ✓(4a, b)).

OBSERVATION 2: Indexical persons do not compete for ⊤-status (compare (3) vs. (4)).

(3) a. Akap Bo ajugaaffigigamiuk nuannaarpoq.
Aka-p Bo ajugaa-vvigi-ga-mi-uk nuannaar-pu-q.
Aka-ERG$^{\top}$ Bo$^{\bot}$ win-tv-FCT$_{\top}$-3SG$_{\top}$-3SG$_{\bot}$ happy-DEC$_{\top}$-3SG
Aka$^{\top}$ beat Bo$^{\bot}$, so he$_{\top}$ (= Aka) was happy.

b. Bo Akap ajugaaffigimmani nuannaanngilaq.
Bo Aka-p ajugaa-vvigi-mm-a-ni nuannaar-nngit-la-q.
Bo$^{\top}$ Aka-ERG$^{\bot}$ win-tv-FCT$_{\bot}$-3SG$_{\bot}$-3SG$_{\top}$ happy-not-DEC$_{\top}$-3SG
Aka$^{\bot}$ beat Bo$^{\top}$, so he$_{\top}$ (= Bo) wasn't happy.

c.* … ajugaaffigigamini
ajugaa-vvigi-ga-mi-ni …
… win-tv-FCT$_{\top}$-3SG$_{\top}$-3SG$_{\top}$ …

(4) a. Akap ajugaaffigigaminga nuannaarpoq. ✓(a) for FCT/HYP/HAB-
Aka-p ajugaa-vvigi-ga-mi-nga nuannaar-pu-q. -1SG/2SG/1PL/2PL
Aka-ERG$^{\top}$ win-tv-FCT$_{\top}$-3SG$_{\top}$-1SG happy-DEC$_{\top}$-3SG
Aka$^{\top}$ beat me, so he$_{\top}$ (= Aka) was happy.

b. Aka ajugaaffigiganni nuannaanngilaq. ✓(b) for FCT/HYP/HAB-
Aka ajugaa-vvigi-ga-n-ni nuannaar-nngit-la-q. -1SG/2SG/1PL/2PL
Aka$^{\top}$ win-tv-FCT$_{\top}$-1SG-3SG$_{\top}$ happy-not-DEC$_{\top}$-3SG
I beat Aka$^{\top}$, so he$_{\top}$ (= Aka) wasn't happy.

Thus, grammatical centering in Kalaallisut reveals a parallel between indexicality and topic-oriented anaphora. On the static view, indexicality and anaphora are unrelated phenomena, so the observed parallel is a mystery. In contrast, this centering parallel makes sense on the dynamic view, because indexicals and topic-oriented anaphors both refer to discourse referents in the current center of attention. We now formally explicate this dynamic view of anaphora (Section 2) and indexicality (Section 3), and then show how it solves the Kalaallisut mystery of indexicals as 'inherent topics' (Section 4).

2. Anaphoric reference in *Simple Update with Centering* (UC_0)

Veltman (1996) proposed a dynamic system he dubbed *Update Semantics* to explicate the intuition that: "You know the meaning of a sentence if you know the change it brings about in the information state of anyone who accepts the news conveyed by it."

Independently, concurrent research on attention-based anaphora resolution (Grosz *et al.* 1995 and related work) showed that the relevant notion of *information* includes, in particular, information about the current state of attention of discourse participants. Dekker (1994) provides useful tools to explicate this intuition, although he himself does not relate his work to centering. In his *Predicate Logic with Anaphora* (PLA), discourse entities are ranked—in centering terms, prominence-ranked—and anaphoric terms denote projection functions that apply to a prominence hierarchy, i.e. a sequence of ranked discourse entities, and return the entity with a specified rank. For example, p_0 refers to the

top-ranked entity; p_1, to the second-ranked entity; p_2, to the third-ranked entity; and so on. Thus, PLA *anaphors* are a third category of individual terms, distinct from *variables* as well as *constants*, both of which are interpreted as in standard *Predicate Logic*.

In *Update with Centering* (UC), developed in Bittner (2001, 2007, 2011), the PLA theory of prominence-based discourse anaphora is refined to distinguish discourse entities that are currently in the center of attention versus background. Intuitively, this binary linguistic contrast parallels the binary visual contrast, between focal versus peripheral vision. Presumably, both of these binary contrasts reflect constraints on attention and short-term memory. Formally, in UC the hierarchy of discourse entities (*dref hierarchy*) is a pair of prominence-ranked sequences. The top sequence consists of prominence-ranked discourse entities (individuals, times, events, etc) in the center of attention (*central drefs*), whereas the bottom sequence consists of prominence-ranked discourse entities in the background (*background drefs*). In the typed system of UC, dref hierarchies are semantic objects of type *s*, whereas *a*-anaphors are logical constants of type *sa*, i.e. *a*-anaphors denote functions from dref hierarchies to semantic objects of type *a* (cf. Muskens 1995).

We begin with a *Simple Update with Centering* (UC_0, defined in the Appendix), which is sufficient to analyze centering-based third person anaphora in Kalaallisut. UC_0 represents third person pronouns by means of four anaphoric concepts. For any dref-hierarchy, $\top$ refers to the top-ranked central individual; $\bot$, to the top-ranked background individual; $\top'$, to the just demoted center; and $\bot'$, to the just demoted background.

central drefs	*background drefs*	
$\langle\langle \mathsf{a}_1, \mathsf{a}_2, \ldots, \mathsf{a}_n\rangle, \langle \mathsf{b}_1, \mathsf{b}_2, \ldots, \mathsf{b}_m\rangle\rangle$		*dref-hierarchy* (type *s*)
$\top \quad \top'$	$\bot \quad \bot'$	*anaphoric concepts* (type *se*)

A state of information (*info-state*) is a set of dref-hierarchies, representing the discourse referents (*drefs*) that are currently available for centering-based anaphora (by anaphoric concepts, $\top$, $\bot$, $\top'$, $\bot'$, or anaphoric descriptions, which we ignore here). If no drefs have been introduced yet, participants are in the *minimal info-state*, $\mathsf{c}_0 = \{\langle\langle\rangle, \langle\rangle\rangle\}$.

This formal system allows us to represent centering-based anaphora in Kalaallisut in a way that is transparently related to the $\top$- and $\bot$-forms of mood and person inflections. For example, discourse (1ii–iv) is analyzed in (6)–(8). We ignore sentence (1i), to avoid irrelevant complexities of plural reference. We also assume the minimal info-state (5) (i.e. no relevant drefs) as the initial input. For each Kalaallisut word (represented by the gloss), the update of attention and/or information is spelled out underneath (DRT-style box, defined in the Appendix). We also spell out the output info-state (set of dref hierarchies, c_n) on a model $\mathcal{M}$ where Ole, ☺, has two friends, ☻ and ☹. Friend ☻ won and is happy, while friend ☹ lost and cries in spite of Ole's attempts to comfort him.

Model $\mathcal{M}$:

$[\![\textit{ole}]\!] = ☺$	$[\![\textit{win}]\!] = [\![\textit{happy}]\!] = \{☻\}$	$[\![\textit{try.console}]\!] = \{\langle ☺, ☹\rangle\}$
$[\![\textit{friend}]\!](☺) = \{☻, ☹\}$	$[\![\textit{lose}]\!] = [\![\textit{cry}]\!] = \{☹\}$	$[\![\textit{won't.listen}]\!] = \{\langle ☹, ☺\rangle\}$

In general, as (6)–(8) illustrate, boxes of the form [x| …x…] update the bottom tier. More precisely, each dref hierarchy in the input info-state is updated by adding a witness for '…x...' to the bottom tier. The output info-state consists of all the dref hierarchies that have been updated in this way. Boxes of the form $^{\top}$[x| …x…] update the top tier in the same way, except that witnesses for '…x…' are added to the top tier. Intuitively, both of these re-centering updates can be thought of as stage-setting directions. A box of the form [x| …x…] or $^{\top}$[x| …x…] is an instruction to introduce a witness for '…x…' into the top-ranked spot in the background or center-stage, respectively. In the output info-state, the added entity is top-ranked on its tier (output $\bot$- or $\top$-value, respectively), and all other entities on that tier are demoted one notch. Finally, boxes of the form […], without any variables, are *tests*—i.e., pure information updates, eliminating dref hierarchies that fail to satisfy the new constraint '…'. For all boxes, '$\top$' and '$\bot$' within the box refer to *input* values—i.e., the input center for '$\top$', the input background for '$\bot$'.

(5) c_0 *initial info-state*
⟨⟨⟩, ⟨⟩⟩ (no relevant drefs)

(6) Ole$^{\bot}$'s friend$^{\top}$ won, so he$_{\top}$ was happy. = (1ii)

[Ole-ERG$^{\bot}$	friend-3SG$_{\bot}$]$^{\top}$	win-FCT$_{\top}$-3SG$_{\top}$	happy-DEC$_{\top}$-3SG
[x| x =$_i$ *ole*];	$^{\top}$[x| *friend*⟨x, $\bot$⟩];	[*win*⟨$\top$⟩];	[*happy*⟨$\top$⟩]
c_1	c_2	c_3	c_4
⟨⟨⟩, ⟨☺⟩⟩	⟨⟨☻⟩, ⟨☺⟩⟩	⟨⟨☻⟩, ⟨☺⟩⟩	⟨⟨☻⟩, ⟨☺⟩⟩
	⟨⟨☹⟩, ⟨☺⟩⟩		

(7) Ole$^{\top}$ tried to console his$_{\top}$ other friend$^{\bot}$, who$_{\bot}$ had lost. = (1iii)

Ole-ERG$^{\top}$	[friend-3SG$_{\top}$.ERG$^{\bot}$	other.3SG$_{\bot}$.$^{\bot}$]
$^{\top}$[x| x =$_i$ *ole*];	[x| *friend*⟨x, $\top$⟩, x =$_i$ $\top'$];	[x| *friend*⟨x, $\top$⟩, $x \neq \bot$]
c_5	c_6	c_7
⟨⟨☺, ☻⟩, ⟨☺⟩⟩	⟨⟨☺, ☻⟩, ⟨☻, ☺⟩⟩	⟨⟨☺, ☻⟩, ⟨☹, ☻, ☺⟩⟩

lose-FCT$_{\bot}$-3SG$_{\bot}$	console-try-in.vain-DEC$_{\top\bot}$-3SG.3SG
[*lose*⟨$\bot$⟩];	[*try.console*⟨$\top$, $\bot$⟩]
c_8	c_9
⟨⟨☺, ☻⟩, ⟨☹, ☻, ☺⟩⟩	⟨⟨☺, ☻⟩, ⟨☹, ☻, ☺⟩⟩

(8) But [the obj. of his$^{\bot}$ sympathy]$^{\top}$, $_{\top}$refusing to listen to him$_{\bot}$, kept crying. = (1iv)

console-try-obj-3SG$_{\bot}$.$^{\top}$
([*try.console*⟨$\top$, $\bot$⟩]; [x| x =$_i$ $\top$]; $^{\top}$[x| x =$_i$ $\bot'$]);
c_{10}
⟨⟨☹, ☺, ☻⟩, ⟨☺, ☹, ☻, ☺⟩⟩

listen-want-not.ELA$_{\top}$-3SG$_{\bot}$	cry-keep.on-DEC$_{\top}$-3SG
[*won't.listen*⟨$\top$, $\bot$⟩];	[*cry*⟨$\top$⟩]
c_{11}	c_{12}
⟨⟨☹, ☺, ☻⟩, ⟨☺, ☹, ☻, ☺⟩⟩	⟨⟨☹, ☺, ☻⟩, ⟨☺, ☹, ☻, ☺⟩⟩

Specifically, in (6), the dependent subject, [Ole-ERG$^{\perp}$ friend-3SG$_{\perp}$]$^{\top}$, updates both tiers, introducing Ole, ☺, into the background, and a friend, center-stage. Since Ole has two friends, ☻ and ☹, there are two dref hierarchies in the output info-state (c_2), since as far as we know at this point, either friend could be the intended referent. Next, two verbs in $\top$-oriented moods (FCT$_{\top}$ and DEC$_{\top}$) add more information about the current topic, i.e., the topical friend. More precisely, they add a background fact (FCT$_{\top}$) that the currently topical friend won, and the main fact (DEC$_{\top}$) that s/he is happy. (The distinction between background vs. main fact cannot be represented in UC$_0$, so it is ignored here.) On the assumed model, only friend ☻ fits this description, so only the hierarchy with ☻ survives.

(7), too, begins with re-centering, followed by information update in the new context. The initial noun phrase promotes Ole, ☺, to topical status, while the second noun phrase introduces Ole's other friend, ☹, into the background (i.e. a friend of the now topical Ole, ☺, other than the just demoted topic, ☻). In the resulting context, the verbs add a background fact (FCT$_{\perp}$), that the currently backgrounded friend, ☹, lost, and the main fact (DEC$_{\top\perp}$), that the currently topical Ole, ☺, tried to comfort him, ☹. Note that UC$_0$ is a true update system—i.e., no information is ever lost. In particular, re-centering is a push-down operation, not an overwrite operation. This will be important in Section 5.

Finally, (8) again starts with re-centering, followed by information update in the resulting context. The re-centering is done by a doubly anaphoric relational noun whose base is the aforementioned relation ('console-try-'). The effect of this noun is to shift the spotlight to the patient, ☹, and demote the agent, ☺, to the background. The verb marked '-ELA$_{\top}$-3SG$_{\perp}$' elaborates ⟨☹, ☺⟩, while '…-DEC$_{\top}$' presents the main fact about ☹.

3. Speech events as central perspectival referents

Unlike the (SEMI-)STATIC VIEW, which posits a dichotomy between variable-like anaphors and directly referential indexicals, our DYNAMIC VIEW suggests a semantic parallel between topic-oriented anaphors and indexicals. The unifying generalization is top-ranked centering status. More precisely, I propose that a topic-oriented anaphor refers to the currently central antecedent, whereas an indexical refers to the currently central speech event or, in languages of the type represented by Slavé, to the currently central attitude state.

To explicate this idea, I extend UC$_0$ along the lines of Bittner (2011), just enough to draw this centering parallel between topic-oriented anaphora and indexicality. Since the extended system must be able to represent discourse reference not only to individuals, but also to events and states, I dub it *Update with Eventuality Centering* (UC$_{\varepsilon}$). It is similar to UC$_0$, except that dref entities are sorted into three types: *individuals* (type δ), *events* (ε), and *states* (σ). Re-centering update boxes of the form $^{\top}[u_a| \ldots u_a \ldots]$ and $[u_a| \ldots u_a \ldots]$ add entities of type a that satisfy '$\ldots u_a \ldots$' to the top and bottom tier, respectively. In what follows, the following notation is used for dref types, dref entities, and variables:

dref type a:	δ (*individuals*)	ε (*events*)	σ (*states*)
type a entity:	☺, a, b, …	e_1, e_2, …	s_1, s_2, …
type a variable:	x	e	s

In UC_{ε}, as in UC_0, a dref hierarchy (type *s*) is a pair of ranked sequences of ranked dref entities in the center of attention (top tier) and in the background (bottom tier). However, since UC_{ε} allows dref entities of different types, it has similarly typed anaphoric concepts. For example, consider the dref hierarchy below, consisting of an individual ☻, state s_1, individual ☺, and event e_0, on the top tier, and on the bottom tier, events e_1, e_2, state s_2, and individual ☹, in that order of prominence. In this dref hierarchy, each dref entity of type *a* is the value of the centering-based anaphor of type *sa* shown below:

central drefs				*background drefs*				
⟨⟨ ☻,	s_1,	☺,	e_0⟩,	⟨e_2,	e_1,	s_2,	☹⟩⟩	*dref hierarchy* (type *s*)
$\top\delta$	$\top\sigma$	$\top'\delta$	$\top\varepsilon$	$\bot\varepsilon$	$\bot'\varepsilon$	$\bot\sigma$	$\bot\delta$	*anaphoric concepts* (type *sa*)

Note that typed dref entities in a UC_{ε} dref hierarchy have two kinds of prominence rank: an *absolute rank*, as a dref entity on a given prominence tier, and a *type-restricted rank*, as a dref entity of type *a* on that tier. For example, in the above dref hierarchy, the state s_1 has the absolute rank $\top'$ (second-ranked dref entity on the top tier), but the σ-restricted rank $\top\sigma$ (top-ranked state on the top tier). Some phenomena are sensitive to the absolute rank (e.g. Slavé indexicals, see Section 5), but most only depend on the type-restricted rank. For example, for centering-based anaphora, adding an individual to a given tier (e.g. ☻ to the top tier) demotes any other individual on that tier one notch (e.g. ☺), but it does not demote drefs of other types on that tier (e.g. the state s_1, or the event e_0) or any individuals on any other tier (e.g. ☹ on the bottom tier). Similarly, adding an event (or state) to a given tier demotes any other event (or state) on that tier one notch, while leaving the type-restricted rank of all other dref entities unaffected.

Following Moens and Steedman (1988), I assume that introducing an eventuality into discourse licenses subsequent discourse reference not only to that eventuality, but also to functionally dependent entities, including the following (see also Bittner 2011):

FUNCTIONAL DEPENDENTS OF EVENTUALITIES

$\vartheta(\cdot)$	*time-of*	$\uparrow(\cdot)$	*central-participant-of*
$^{\triangleright}(\cdot)$	*consequent-state-of*	$\downarrow(\cdot)$	*background-participant-of*

Last but not least, I assume a *start-up update*: the act of speaking up focuses attention and thereby licenses discourse reference to that very speech event, e.g., by indexicals. Thus, in UC_{ε} it is never true that there are no relevant drefs. The very act of speaking up, e_0, introduces that speech event as a *central perspectival dref*—that is, it gives rise to the following e_0-*minimal info-state* (written $^{st}(e_0)$, i.e. the result of applying the minimal-info-*st*ate-forming function, $^{st}(\cdot)$, to the event e_0):

e_0-MINIMAL INFO-STATE

$^{st}(e_0)$

$\langle\langle e_0\rangle, \langle\rangle\rangle$

This start up update is intuitively similar to Stalnaker's (1978) 'commonplace effect' of speech acts and can be viewed as a partial implementation of this effect:

> "[W]hen I speak, I presuppose that others know I am speaking […]. This fact, too, can be exploited in the conversation, as when Daniels says *I am bald,* taking it for granted that his audience can figure out who is being said to be bald. I mention this COMMONPLACE WAY [MB emphasis] that assertions change the context in order to make clear that the context on which an assertion has its ESSENTIAL EFFECT is not defined by what is presupposed before the speaker begins to speak, but will include any information which the speaker assumes his audience can infer from the performance of the speech act." (Stalnaker 1978, p. 323)

For example, suppose that a homeless man approaches you in the street and says:

(9) I am hungry.

The man is a stranger, you do not know his name or anything else about him, and yet you have no difficulty interpreting what he says. In UC_ε, we can represent the change in the state of information and attention due to (9) as in (9′). By speaking up, e_0, the man focuses attention, setting up the e_0-minimal info-state, ${}^{st}(e_0)$. This is the context for interpreting what he says—i.e. sentence (9). Indexicals in (9′) refer to functional dependents of the speech act, e_0, which is the currently central perspectival dref (value of $\top\varepsilon$). Specifically, the first person pronoun (1SG) refers to the central participant of this speech act, i.e. the e_0-speaker ($\uparrow\top\varepsilon$), while the present tense (PRS) refers to the e_0-time ($\vartheta\top\varepsilon$). The stative predicate *be hungry* introduces a hungry state of the e_0-speaker that holds at the e_0-time. The definition of truth in UC_ε is the same as in UC_0 (see Appendix). So the UC_ε update in (9′), [s| …], is true in the e_0-minimal info-state, ${}^{st}(e_0)$, just in case the output of updating ${}^{st}(e_0)$ with the denotation of [s| …] is not empty. That is, it is true just in case there is a hungry state of the e_0-speaker that holds at the e_0-time (see sample model).

(9′) I am hungry.
1SG PRS be hungry
$[s|\ \vartheta\top\varepsilon \subseteq_i \vartheta s, \mathit{hungry}\langle s, \uparrow\top\varepsilon\rangle]$
c_1
$\langle\langle e_0\rangle, \langle s_1\rangle\rangle$

Model for (9′)

——————————➤ real time

Discourse ref.	*Symbol*: *Description*
●	${}^{\top}e_0$: e_0-speaker (= $[\![\uparrow]\!](e_0)$) speaks up
———	s_1: $[\![\vartheta]\!](e_0) \subseteq [\![\vartheta]\!](s_1)$, e_0-speaker is hungry

Thus, the proposed analysis in UC_ε predicts intuitively correct truth condition. It also reconstructs Kaplan's (1979) idea that indexicals refer directly to the utterance—in UC_ε, the dref for the central perspective point, $\top\varepsilon$. I assume that eventualities of verbs go

on the bottom tier (like s_1 in (9′); see Bittner 2001, 2007, 2011). So no matter how many verbs may be uttered, the initial event of speaking up will maintain its status as the central perspective point, $\top\varepsilon$. As long as it does, the reference of pure indexicals, which refer to functional dependents of the speech act, $f\top\varepsilon$, is predicted to be rigid. However, their reference can be shifted by direct quotes, which temporarily shift the central perspectival dref (see Bittner 2007). For instance, in (10) the verb *say* introduces a bottom-tier speech event (e_1). An anaphoric *opening quote* (“) promotes this event to $\top\varepsilon$-status until the *closing quote* (”). Therefore, indexicals outside of the quote (*2SG PST 1SG* “…” *1SG PRS 2SG*) are anchored to the event of speaking up (e_0), whereas indexicals within the quote (“*1SG PRS*…”) are anchored to the speech event introduced by the verb *say* (e_1).

(10) You said to me:
2SG PST say to 1SG:
$[e|\ \vartheta e <_i \vartheta\top\varepsilon,\ spk.to\langle e, \downarrow\top\varepsilon, \uparrow\top\varepsilon\rangle]$;
c_1
$\langle\langle e_0\rangle, \langle e_1\rangle\rangle$

“	I am hungry.	”
	1SG PRS be hungry	
$^{\top}[e|\ e =_i \bot\varepsilon]$;	$[s|\ \vartheta\top\varepsilon \subseteq_i \vartheta s,\ hungry\langle s, \uparrow\top\varepsilon\rangle]$;	$^{\top}[e|\ e =_i \top'\varepsilon]$;
c_2	c_3	c_4
$\langle\langle e_1, e_0\rangle, \langle e_1\rangle\rangle$	$\langle\langle e_1, e_0\rangle, \langle s_1, e_1\rangle\rangle$	$\langle\langle e_0, e_1, e_0\rangle, \langle s_1, e_1\rangle\rangle$

and I have fed you.
and 1SG PRS have PRF feed 2SG
$[e|\ feed\langle e, \uparrow\top\varepsilon, \downarrow\top\varepsilon\rangle]$; $[s|\ \vartheta\top\varepsilon \subseteq_i \vartheta s,\ s =_i {}^{\triangleright}\bot\varepsilon]$
c_5
$\langle\langle e_0, e_1, e_0\rangle, \langle s_2, e_2, s_1, e_1\rangle\rangle$

The analysis in (10) is only partial, because drefs for worlds and times cannot be represented in UC_ε. However, this analysis can be augmented with such drefs in a UC-logic with a richer ontology, without affecting the key point about perspectival re-centering by direct quotes (see Bittner 2007, 2011).

4. Mystery solved: Indexicals as ‘inherent topics’

Having explicated the dynamic view of anaphora and indexicality, we now have the tools to explain the Kalaallisut mystery of indexicals as ‘inherent topics’. That is, the parallel drawn by the Kalaallisut centering system is a mystery only if we assume a (semi-)static view, where (static or dynamic) anaphora and (static) indexicality are unrelated phenomena (e.g. Kaplan 1979, Kamp 1985, Zeevat 1999, Schlenker 2003, Anand and Nevins 2004, etc). Far from being a mystery, this parallel is expected on the present dynamic view, where topic-oriented anaphora and indexicality are two types of discourse reference to central drefs introduced by prior updates. The unifying generalization is that both topical drefs and central perspectival drefs are in the center of attention—topical drefs, in virtue of being under discussion, and perspectival drefs, in virtue of serving as central per-

spective points to anchor that discussion (see Bittner 2007, 2011, implementing Stalnaker 1978).

Consider again the Kalaallisut evidence that indexical persons are inherent topics. One piece of evidence comes from dependent moods (FCT, HYP, HAB, ELA), whose form indicates the centering status of the dependent subject. Third person subjects select the $\top$-form or the $\bot$-form of the dependent mood, depending on whether the third person dref is or is not the matrix topic (see (6), (7), and (11a, b) below). In contrast, indexical subjects always select the $\top$-form, whatever the matrix topic (see (2), and (11c) below). The reason, I suggest, is that $\top$-moods require $\top$-subjects. Topical third and indexical persons qualify as $\top$-drefs, because they translate into $\top\delta$ and $f\top\varepsilon$, respectively, where the function f is $\uparrow(\cdot)$ (central participant), for the first person, or $\downarrow(\cdot)$ (background participant), for the second person (hence, (11a) ~ (11c)). In contrast, background third person subjects translate into $\bot\delta$ and thus satisfy the $\bot$-subject requirement of $\bot$-moods (11b).

(11a) Ole$^{\top}$ won, so he$_{\top}$ (= Ole) …
Ole ajugaa-ga-mi
Ole$^{\top}$ win-FCT$_{\top}$-3SG$_{\top}$
$^{\top}[x|\, x =_i ole]$; $[e|\, win\langle e, \top\delta\rangle, \vartheta e <_i \vartheta\top\varepsilon]$; $^{\top}[s|\, s =_i {}^{\triangleright}\bot\varepsilon]$; …
c_1 c_2
$\langle\langle \odot, e_0\rangle, \langle\rangle\rangle$ $\langle\langle s_1, \odot, e_0\rangle, \langle e_1\rangle\rangle$

(11b) Ole$^{\bot}$ won, so he$_{\top}$ (≠ Ole) …
Ole ajugaa-mm-at
Ole$^{\bot}$ win-FCT$_{\bot}$-3SG$_{\bot}$
$[x|\, x =_i ole]$; $[e|\, win\langle e, \bot\delta\rangle, \vartheta e <_i \vartheta\top\varepsilon]$; $^{\top}[s|\, \vartheta s =_i \vartheta({}^{\triangleright}\bot\varepsilon), \uparrow s \neq_i \bot\delta]$; …
c_1 c_2
$\langle\langle e_0\rangle, \langle \odot\rangle\rangle$ $\langle\langle s_1, e_0\rangle, \langle e_1, \odot\rangle\rangle$

(11c) I won, so {I | Ole$^{\top}$} … ~ (11a)
Ajugaa-ga-ma …
win-FCT$_{\top}$-1SG
$[e|\, win\langle e, \uparrow\top\varepsilon\rangle, e <_i \top\varepsilon]$; $^{\top}[s|\, s =_i {}^{\triangleright}\bot\varepsilon]$; …
c_2
$\langle\langle s_1, e_0\rangle, \langle e_1\rangle\rangle$

In addition, factual mood (FCT) requires the verb's event (here, the victory e_1) to be realized prior to, and in the same world as, the central perspectival event dref (speech act e_0)—i.e. to be *currently verifiable* from that perspective (Bittner 2007, 2011). In (11a–c), we ignore the world dref because it cannot be represented in UC$_{\varepsilon}$. When a factual dependent precedes the matrix, it sets the context by introducing a *topic state* (s_1) for matrix comment. The topic state depends on the centering status of the dependent subject. If this is a $\top$-dref, then the topic state is the consequent state of the dependent event (see (11a, c)). The consequent state is centered on the same $\top$-dref, so the matrix comment is expected to say something about the topical state (s_1) of this $\top$-dref resulting from the context-setting event (victory e_1). If the dependent subject is a topical third person ($\top\delta$),

the matrix conforms to this default (e.g. (6)). But if it is an inherent topic ($f\top\varepsilon$), the default can be defeated by introducing a different $\top$-subject (e.g. 'Ole$^{\top}$' in (2b)). In that case, the matrix comment addresses the topical consequent state (s_1) by saying something about the new $\top$-subject at the time of that topical state. In contrast, if the dependent subject is a $\perp$-dref, the topic state is concurrent with the consequent state (i.e. the time frame to be addressed by the matrix comment is still the same), but it is centered on a different individual (see (11b))—to wit, the expected $\top$-subject of the matrix comment (recall (7)).

The second piece of Kalaallisut evidence that indexical persons are inherent topics comes from transitive verbs. In Kalaallisut, these require disjoint arguments, so third person arguments compete for topical status. Either the subject or the object individual can be the current value of $\top\delta$ (12a, b), but not both, on pain of absurdity (*(12c)).

(12a) Aka$^{\top}$ beat Bo$^{\perp}$ so …
Aka-p Bo
Aka-ERG$^{\top}$ Bo$^{\perp}$
($^{\top}[x|\ x =_i aka]$; $[x|\ x =_i bo]$);
c_1
$\langle\langle a, e_0\rangle, \langle b\rangle\rangle$

ajugaa-vvigi-ga-mi-uk …
win-tv-FCT$_{\top}$-3SG$_{\top}$-3SG$_{\perp}$
$[\top\delta \neq_i \perp\delta]$; ($[e|\ beat\langle e, \top\delta, \perp\delta\rangle, \vartheta e <_i \vartheta\top\varepsilon]$; $^{\top}[s|\ s =_i {}^{\triangleright}\perp\varepsilon]$); …
c_2
$\langle\langle s_1, a, e_0\rangle, \langle e_1, b\rangle\rangle$

(12b) Aka$^{\perp}$ beat Bo$^{\top}$ so …
Bo Aka-p
Bo$^{\top}$ Aka-ERG$^{\perp}$
$^{\top}[x|\ x =_i bo]$; $[x|\ x =_i aka]$;
c_1
$\langle\langle b, e_0\rangle, \langle a\rangle\rangle$

ajugaa-vvigi-mm-a-ni …
win-tv-FCT$_{\top}$-3SG$_{\top}$-3SG$_{\perp}$
$[\top\delta \neq_i \perp\delta]$; ($[e|\ beat\langle e, \perp\delta, \top\delta\rangle, \vartheta e <_i \vartheta\top\varepsilon]$; $^{\top}[s|\ \vartheta s =_i \vartheta({}^{\triangleright}\perp\varepsilon), \uparrow s \neq_i \perp\delta]$); …
c_2
$\langle\langle s_1, b, e_0\rangle, \langle e_1, a\rangle\rangle$

(12c) * ajugaa-vvigi-ga-mi-ni …
win-tv-FCT$_{\top}$-3SG$_{\top}$-3SG$_{\top}$
$[\top\delta \neq_i \top\delta]$; …

In Kalaallisut, a reflexive transitive verb like (12c) is ruled out, because the disjointness test requires that the topical individual must not be self-identical ($[\top\delta \neq_i \top\delta]$). This requirement would reduce any input info-state to the absurd state ($\varnothing$), so one could never use such a verb. (Reflexive predicates in Kalaallisut are intransitive—e.g. defeating oneself is encoded as a property of one individual, not a relation between two.)

In contrast, if one or both of the arguments are indexical persons, then both can have $\top$-status. As inherent topics, indexical persons refer to individual-valued functions of the central perspectival event ($\uparrow\top\varepsilon$, for the first person; $\downarrow\top\varepsilon$, for the second person). Therefore, no absurdity threatens if the disjointness test of a transitive verb requires the value of such an indexical function to be disjoint from the topical third person individual ($\top\delta$) or from the value of another indexical function (e.g. $\uparrow\top\varepsilon$ versus $\downarrow\top\varepsilon$). For instance, in (13a, b) the disjointness test requires the speaker to be disjoint from the topical Aka ($[\![\uparrow]\!](e_0) \neq a$), whereas in (13c), it requires the speaker to be disjoint from the addressee ($[\![\uparrow]\!](e_0) \neq [\![\downarrow]\!](e_0)$). Both disjointness requirements are sensible. Indeed, intuitively, that is precisely how these Kalaallisut sentences are interpreted—for example, (13a, b) cannot be felicitously uttered by the topical Aka (a).

(13a) Aka$^{\top}$ beat me, so …
Aka-p ajugaa-vvigi-ga-mi-nga …
Aka-ERG$^{\top}$ win-tv-FCT$_{\top}$-3SG$_{\top}$-1SG
$^{\top}[x|\, x =_i aka]$; $[\uparrow\top\varepsilon \neq_i \top\delta]$; $([e|\, beat\langle e, \top\delta, \uparrow\top\varepsilon\rangle, \vartheta e <_i \vartheta\top\varepsilon]$; $^{\top}[s|\, s =_i {}^{\triangleright}\perp\varepsilon])$; …
c_1 c_2
$\langle\langle a, e_0\rangle, \langle\rangle\rangle$ $\langle\langle s_1, a, e_0\rangle, \langle e_1\rangle\rangle$

(13b) I beat Aka$^{\top}$, so …
Aka ajugaa-vvigi-ga-n-ni …
Aka$^{\top}$ win-tv-FCT$_{\top}$-1SG-3SG$_{\top}$
$^{\top}[x|\, x =_i aka]$; $[\uparrow\top\varepsilon \neq_i \top\delta]$; $([e|\, beat\langle e, \uparrow\top\varepsilon, \top\delta\rangle, \vartheta e <_i \vartheta\top\varepsilon]$; $^{\top}[s|\, s =_i {}^{\triangleright}\perp\varepsilon])$; …
c_1 c_2
$\langle\langle a, e_0\rangle, \langle\rangle\rangle$ $\langle\langle s_1, a, e_0\rangle, \langle e_1\rangle\rangle$

(13c) I beat you, so …
Ajugaa-vvigi-ga-kkit …
win-tv-FCT$_{\top}$-1SG.2SG
$[\uparrow\top\varepsilon \neq_i \downarrow\top\varepsilon]$; $([e|\, beat\langle e, \uparrow\top\varepsilon, \downarrow\top\varepsilon\rangle, \vartheta e <_i \vartheta\top\varepsilon]$; $^{\top}[s|\, s =_i {}^{\triangleright}\perp\varepsilon])$; …
c_1 c_2
$\langle\langle e_0\rangle, \langle\rangle\rangle$ $\langle\langle s_1, e_0\rangle, \langle e_1\rangle\rangle$

Thus, the Kalaallisut puzzle of indexicals as inherent topics is solved by the present theory, where anaphora and indexicality are two types of centering-based reference.

5. Attitude states as central perspectival referents: Slavé evidence

So far, all the examples of perspectival drefs for indexicals were speech events. The initial act of speaking up introduces that very speech event as the top-ranked perspectival dref (start-up update). After an eventive verb of communication (e.g. *say*, *whisper*, *shout*, etc), a direct quote may temporarily update the top-ranked perspectival dref to the speech event of that verb for the duration of the quote, thus shifting the reference of all indexicals within that quote (recall (10)). In this way, UC$_{\varepsilon}$ formally explicates Stalnaker's (1978) 'commonplace effect' of speech acts as discourse reference to the currently top-

ranked central speech event. Intuitively, attitude states give rise to a similar 'common-place effect'. That is, transposing Stalnaker's formulation for speech acts, when I believe or want something, I am aware of being in this attitudinal state. This fact, too, can be used to characterize the propositional object of my attitude. For example, if I want to win I am in a state of desire that is satisfied in those worlds where the experiencer of this attitudinal state wins. I can be aware of having this *de se* desire, even if I suffer amnesia and do not know who I am—i.e. I have forgotten my name, when and where I was born, and everything else about me. All I need to be aware of is the attitudinal state itself.

In Bittner (2007, 2011), I used this basic idea—implemented in update systems with centering-based discourse reference (similar to UC_{ε}, but including modal drefs)—to analyze suffixal attitude predicates in Kalaallisut: *-niar* 'intend', *-juma* 'want', *-ssamaar* 'plan', etc. These stative suffixes introduce attitudinal states of *de se* intent, *de se* desire, *de se* plan, etc, like stative attitude verbs with non-finite complements in Indo-European languages (see Lewis 1979, Chierchia 1989, Schlenker 2003, a.m.o.). My present goal is to use this analysis of *de se* attitudes together with evidence from indexical-shifting attitude verbs in Slavé (Northern Athabaskan) to argue that, in addition to speech events, attitude states can also serve as central perspectival drefs for indexicals. Although indexical-shifting verbs are also found in other languages (see Schlenker 2003 on Amharic, Anand and Nevins 2004 [hereafter, 'A&N'] on Zazaki, etc), I have chosen to focus on Slavé for two reasons. One is the existence of a detailed description of various classes of attitude verbs and their varying effects on the interpretation of indexicals in Slavé (Rice 1986; see also Speas 1999, on a related Athabaskan language, Navajo). Secondly, the Slavé pattern of indexical shifts in attitude reports is particularly challenging and problematic for existing approaches (e.g. Schlenker 2003 and A&N, discussed below).

In Slavé, certain attitude verbs allow selected pronominal arguments to take the perspective of the attitude holder instead of the speaker. Apparently, no attitude verb requires this perspectival shift, although some indirect speech verbs do. In the Athabaskan literature (including Rice 1986, Speas 1999), indexical-shifting report verbs are called 'direct discourse verbs'. I do not use this terminology, because it misleadingly suggests that *all* indexicals in the complement take the perspective of the attitude holder, as they would in an actual direct quote. In fact, what happens in Slavé is more complex and more interesting: some indexicals never shift, while shiftable indexicals are affected differently by different attitude verbs. Judging by Rice (1986) and Speas (1999), indexical *modifiers* (e.g. 'today', 'tomorrow', 'here') never shift in Athabaskan—i.e., they always take the perspective of the speaker, never the attitude holder. Only pronominal *argument* inflections (subject, object, and possessor) can shift to the perspective of the attitude holder if the controlling attitude verb permits this shift (Rice 1986).

Each attitude verb controls which pronominal arguments, if any, in the complement can shift. Rice (1986) describes three classes of Slavé attitude verbs, which I dub SPEAKER-CENTERED, IV-SHIFT (intransitive), and TV-SHIFT (transitive). For each class of attitude verb, Figure 1 below summarizes the characteristic effects on the interpretation of pronominal arguments in the complement. Paradigm examples illustrating these effects are given in (14) through (16) below. All Slavé examples are from Rice (1986). Shifted

pronominal argument inflections are italicized in the gloss (e.g. attitude holder's '*1SG*' vs. speaker's '1SG').

Figure 1. Slavé attitude verbs

Class	Example	Complement pronominal inflections
SPEAKER-CENTERED	*-egodịhshǫ* 'know'	speaker's 1, 2, 3
IV-SHIFT	*yenịwę* 'want' (iv)	attitude holder's 1, 3 (optional) speaker's 2
TV-SHIFT	*-udeli* 'want' (tv)	attitude holder's 1, 3 (optional) speaker's 2 matrix object = complement argument

(14) SPEAKER-CENTERED ATTITUDE VERB (Slavé)
John ?erákie?ĭe wihsị gú kodihshǫ.
Jonn [parka 1SG.make C] 3SG.know
John knows that I made a parka. (speaker's '1SG')

(15) IV-SHIFT ATTITUDE VERB (Slavé)
a. hịdowedzíné k'e rírawohjá yenịwę.
[tomorrow on *1SG*.will.return] 3SG.want
He wants to return tomorrow. (attitude holder's '*1SG*', speaker's 'tomorrow')

b. bets'ę ráwǫdí yenịwę.
[*3SG*.to 2SG.will.help] 3SG.want
He wants you to help me/her. (attitude holder's '*3SG*', speaker's '2SG')

(16) TV-SHIFT ATTITUDE VERB (Slavé)
a. sets'ę ráwǫdi sudeli.
[*1SG*.to *3SG*.will.help] 3SG.want.1SG
He wants me to help him$_{se}$. (attitude holder's '*1SG*', '*3SG*')

b. bets'ę ráwǫdí sudeli.
[*3SG*.to 2SG.will.help] 3SG.want.1SG
He wants you to help me. (attitude holder's '*3SG*', speaker's '2SG')

The SPEAKER-CENTERED class, which includes most attitude verbs in Slavé, presents the complement from the perspective of the speaker. For example, in (14), '1SG' in the complement refers to the speaker—i.e. the person the speaker thinks of as *I*, not the attitude holder. If the input perspective represents someone else's point of view (e.g. the man's, in (17)), a speaker-centered verb ('know') returns to the speaker's perspective:

(17) ?eyi dene [[se-?erákie?ĭe ?ónéduh?â] kegoduhshá] yenịwę
that man [[1SG-parka 1SG.will.sell] *1SG*.will.know] 3SG.want
The man wants to know if I'll sell my parka. (des.-holder's '*1SG*', speaker's '1SG')

Perspectival discourse referents for indexicals

Intransitive IV-SHIFT attitude verbs allow first and third person pronouns in the complement to take the perspective of the attitude holder. In contrast, complement second person pronouns always take the perspective of the speaker. For example, in (15a) '*1SG*' in the complement refers to the attitude holder, not the speaker. Similarly, in (15b), '*3SG*' refers to the person the attitude holder thinks of as *s/he*. This person could be the speaker or someone the speaker, too, thinks of as *s/she*, so Slavé (15b) has two translations in English (which always takes the speaker's perspective). In either case, the complement '2SG' refers to the speaker's *you*, i.e. the current addressee. In (17), the matrix iv-shift verb *yeɲịwẹ* 'want' shifts the perspective to the attitude holder for its IMMEDIATE SCOPE, i.e. the part of its complement that is not in the scope of any other report verb—here, the speaker-centered *egodịhshọ* 'know', which shifts the perspective back to the speaker. Thus, the two instances of '1SG' in the complement of 'know' refer to the speaker, and only the '*1SG*' subject of 'know' refers to the attitude holder of 'want'. According to Rice (1986), Slavé speech and attitude verbs generally have such strictly local effects.

Transitive TV-SHIFT attitude verbs likewise license the shift to the attitude holder's perspective for first and third person pronouns in the complement (e.g. '*1SG*' in (16a), '*3SG*' in (16a, b)), but not for second person pronouns (e.g. speaker's '2SG' in (16b)). In addition, the matrix object co-refers with a selected argument in the complement. This argument is selected by the matrix verb on the basis of the persons involved in the matrix and the complement (e.g. in (16a, b), the matrix object '1SG' corefers with the complement '*3SG*'; see Rice 1986 for the person selection rules and additional examples).

I propose that these complex interactions reflect explicit marking of perspectival (re)centering in Slavé—a grammatical system that allows not only speech events, but also attitude states to serve as the central perspectival dref. The contrast between indexical *modifiers*, which always take the speaker's perspective, and pronominal *arguments*, which may shift, can be accounted for in UC_{ε} by positing different lexical meanings. Specifically, I propose that in Slavé, indexical modifiers (e.g. *hịdowedzíné* 'tomorrow' in (15a)) are always anchored to the currently central speech act ($\top\varepsilon$), whereas *pronominal argument* inflections are anchored to the highest-ranking perspectival dref (speech act, $\top\varepsilon$, or attitude state, $\top\sigma$, whichever has the higher absolute rank) for which the relevant individual-valued functions (e.g. $\uparrow(\cdot)$ for '1SG' and '3SG', $\downarrow(\cdot)$ for '2SG') are defined.

In addition, the three classes of Slavé attitude verbs have different anaphoric presuppositions and perspectival re-centering potentials. SPEAKER-CENTERED attitude verbs presuppose that the highest-ranking perspectival dref is the current speech act ($\top\varepsilon$). If need be, they accommodate this presupposition by re-centering (as in (17), à la direct quotes in (10)). In contrast, when an IV- or TV-SHIFT verb introduces an attitude *de se*, it updates the highest perspectival dref to that attitudinal state for the duration of the complement. In the immediate scope of the verb, any occurrence of '1SG' then refers to the attitude holder ($\uparrow\top\sigma$), while '3SG' presupposes disjointness from the attitude holder. In addition, transitive TV-SHIFT attitude verbs relate the attitude holder ($\uparrow\top\sigma$) to a *res*, identified from the input perspective by the object inflection on the verb and from the attitude holder's perspective in the complement (e.g. in (16a, b), speaker's '1SG' = attitude holder's '*3SG*').

Finally, since attitude states have no addressees, $\downarrow\top\sigma$ is undefined. Therefore, even when a TV- or IV-SHIFT verb promotes its own attitude state to the status of the top-ranked perspectival dref, any occurrence of '2SG' in the complement will still refer to the addressee of the currently central speech event ($\downarrow\top\varepsilon$), since this speech event is still the highest ranked perspectival dref for which the addressee function is defined.

This analysis predicts that second person might be shifted by a verb of directed speech, since this introduces a speech event for which both the speaker and the addressee functions, $\uparrow(\cdot)$ and $\downarrow(\cdot)$, are defined. And indeed, Athabaskan languages have transitive TV-SHIFT SPEECH verbs, which introduce directed speech events of this kind (see (Slavé (18a), Navajo (19a)). In the complement, indexical modifiers are still anchored to the initial event of speaking up ($\top\varepsilon$), as usual. In contrast, all indexical arguments—including second person pronouns—shift to the agent's perspective. The reason, I suggest, is that a tv-shift speech verb introduces the *progress state* of its speech event as the highest perspectival dref ($\top\sigma$) for the complement. The progress state has the same participants as the verb's speech event, so the complement '*1SG*' and '*2SG*' refer to the agent ($\uparrow\top\sigma$) as well as his addressee ($\downarrow\top\sigma$) from the agent's current perspective ($\top\sigma$).

(18) TV- vs. IV-SHIFT SPEECH VERBS (Slavé: Rice 1986)

a. segha ráwǫdí sédįdi yįlé.
[*1SG*.for *2SG*.buy.3SG] 2SG.say.to.1SG PST
You told me to buy it for you. (agent's '*1SG*', '*2SG*')

b. Simon rásereyineht'u hadi.
Simon [2SG.hit.*1SG*] 3SG.*say*
Simon said you hit him$_{se}$. (agent's '*1SG*', speaker's '*2SG*')

(19) TV-SHIFT SPEECH vs. ATTITUDE VERBS (Navajo: Speas 1999)

a. Jáan chidi nahidíiłnih shiłni.
John [car *2SG*.buy.3SG] 3SG.say.to.1SG
John told me to buy a car. (agent's '*2SG*' = speaker's '1SG')
(Lit. John said to me [you buy a car].)

b. Jáan chidi nahizhdoołnih shó'ni.
John [car *4SG*.buy.3SG] 3SG.expect (lit. say.of).1SG
John expects me to buy a car. (attitude holder's *res* '*4SG*' = speaker's '1SG')
(Lit. John said of me [that guy will buy a car].)

In Athabaskan, this type of perspectival recentering only happens with *transitive speech* verbs (*-di* 'say to' in Slavé, *-łní* 'say to' in Navajo), whose argument inflections (subject and object) express both of the participating individuals. For example, in Slavé, the related *intransitive* speech verb (*hadi* 'say'), which only expresses the agent (subject), gives rise to an iv-type perspectival shift, i.e. to a subject-only perspective in the complement. That is, complement second persons take the perspective of the current speaker, not of the verb's agent (see (18b)). This is explained by the proposed perspectival recentering, from the current speech act ($\top\varepsilon$) to the progress state ($\top\sigma$) of the verb's event, because the progress state has the same participants as that event. (Formally, the progress

state function preserves the values of the participant functions, i.e. of ↑(·) and ↓(·), if these are defined, and preserves undefinedness, otherwise.) Similarly, in Navajo, perspectival shifts by transitive derivatives of *ní* 'say' depend on whether the derived transitive verb introduces a directed speech *event* (*-łní* 'say to' in (19a)), or a *de re* attitude *state* (*-ó'ní* 'expect', lit. 'say of' in (19b)). Thus, the central perspectival dref for the complement is either the progress state of the verb's speech event (preserving the values of ↑(·) and ↓(·)) or the verb's attitude state itself (for which only ↑(·) is defined).

Competing approaches fail to account for the full range of Slavé data exemplified in (14)–(18). Schlenker (2003), who mentions Slavé and cites Rice (1986), proposes a PRONOUN-BASED approach. His basic idea is that *de se* attitude verbs introduce a Kaplan-style context—to wit, a tuple $c = \langle A_c, t_c, w_c \rangle$ of an 'author' A_c, time t_c, and world w_c—and languages with shiftable pronouns allow such pronouns to be anchored to the attitude-holder's context instead of the utterance context. On this view, the lexical meanings of Slavé first and third person pronouns would allow anchoring to either context.

A conceptual problem with Schlenker's theory is that it conflates speech *events* with attitude *states*. It, therefore, cannot explain why they interact differently with second person reference (witness Slavé (18a) vs. (16b), Navajo (19a) vs. (19b)) as well as temporal discourse reference (see e.g. Bittner 2007, 2011). An empirical problem, noted by A&N, is that Schlenker's pronoun-based approach massively overgenerates, predicting many unattested readings. In complements with multiple shiftable pronouns, it allows different pronouns to be anchored to different contexts. In fact, in Slavé (20) both first persons pronouns must shift together, as A&N observe.

(20) [se-hlégé se-gha gon'ihkie rárulu] yudeli.
[*1SG*-friend *1SG*-for slippers *3SG*.will.sew] 3SG.want.4SG
'She wants her$_{se}$ friend to sew slippers for her$_{se}$.' (attitude holder's '*1SG*', '*3SG*')
NOT e.g. 'She wants her$_{se}$ friend to sew slippers for me.'

To capture this 'shift together' constraint, A&N propose an OPERATOR-BASED approach. Specifically, they modify Schlenker's theory of *de se* attitudes so that the complement is evaluated with respect to a richer 'context', which also includes a coordinate for the 'hearer' (*H*). They further propose that Slavé indexical-shifting verbs introduce context-modifying operators that overwrite selected coordinates of the complement context with values representing the attitude holder's perspective. For example, if (20) is uttered in a context $c = \langle A_c, H_c, t_c, w_c \rangle$, the context-modifying operator introduced by the verb *-udeli* 'want' will selectively overwrite the agent-coordinate (A_c) of the complement context with the attitude holder (A_j), while leaving the hearer-coordinate (H_c) unchanged (i.e. still the addressee of *c*). Thus, throughout the scope of *-udeli* 'want', first and third person pronouns are predicted to refer to individuals that the attitude holder (A_j) thinks of as *I* and *s/he*, respectively (as in (16a, b) and (20)), whereas second person pronouns are predicted to refer to the current addressee (H_c, as in (16b)).

But this prediction fails to capture Rice's (1986) generalization that the effect of each Slavé report verb is restricted to its *immediate scope* only (recall (17)). This generalization cannot be captured by modeling a shift of perspective as an overwrite operation, as in the operator-based theory of A&N. In contrast, it is correctly captured by modeling it as a push-down operation, as in the proposed centering-based theory. In UC_{ε}, introducing a new perspective only demotes the input perspectival dref one notch. It does not irretrievably eliminate that dref from discourse, as overwriting it with a new value would.

A more fundamental problem with A&N's theory is that their formal notion of 'context' does not make intuitive sense. In the original theory of Kaplan (1979), an utterance context was a tuple $c = \langle A_c, t_c, l_c, w_c \rangle$ (in A&N notation) such that, in the world w_c, the individual A_c is in the location l_c at the time t_c. Intuitively, this represents a speech event in a world. The extended notion of a 'context' proposed by Schlenker (2003) covers both speech events and attitude states—an odd class, perhaps, but still intuitively clear. In contrast, it is not clear what the modified 'contexts' of A&N represent, so the predictions of their theory are intuitively opaque. For instance, a Slavé sentence similar to (18b) ('Simon said that …'), is assigned a truth condition of the form '$\forall j$ compatible with what Simon says in i, …', where j is a modified 'context' (see A&N, p. 28, example (30)). Since j represents neither the speaker's perspective nor Simon's, it is hard to make intuitive sense of this truth condition. Therefore, it is not clear how to test it with Slavé consultants. This problem alone is, in my view, reason enough to look for an intuitively more transparent theory, such as the perspectival re-centering approach I propose.

6. Conclusion

Evidence from Kalaallisut and Slavé favors a dynamic view of indexicality, as a species of discourse reference like anaphora, except that the relevant discourse referent is introduced by the very act of speaking up. In the grammatical centering system of Kalaallisut, this dynamic view explains parallels between indexical reference (to 1st and 2nd persons) and topic-oriented anaphora (to $3_{\top}$). In addition, indexicals in Slavé attitude reports show that, not only speech events, but also attitude states can serve as central perspectival referents for indexicals. A more general point illustrated by this research is that evidence from under-studied languages can substantially change our view of much studied phenomena, such as indexicality and discourse anaphora.

Appendix: *Simple Update with Centering* (UC_0)

DEFINITION 1. The set of UC_0 *types* is the smallest set Θ such that (i) t (truth values), e (entities), s (dref hierarchies) $\in \Theta$, and (ii) if $a, b \in \Theta$, then $(ab) \in \Theta$.

DEFINITION 2. A UC_0-*frame* is a set $\{\mathcal{D}_a | \ a \in \Theta\}$ of non-empty *a-domains* $\mathcal{D}_a$ such that:

i. $\mathcal{D}_t = \{1, 0\}$ and $\mathcal{D}_e$ are non-empty disjoint sets
   $\mathcal{D}_s = \cup_{n \geq 0,\, m \geq 0} \{\langle \langle \mathsf{a}_1, \ldots, \mathsf{a}_n \rangle, \langle \mathsf{b}_1, \ldots, \mathsf{b}_m \rangle \rangle : \mathsf{a}_i, \mathsf{b}_j \in \mathcal{D}_e\}$

ii. $\mathcal{D}_{(ab)} = \{f | \ \mathrm{Dom}\ f \subseteq \mathcal{D}_a \ \&\ \mathrm{Ran}\ f \subseteq \mathcal{D}_b\}$

DEFINITION 3. A UC_0-*model* is a pair $\mathcal{M}=\langle\mathcal{D}, [\![\cdot]\!]\rangle$ of a UC_0-frame $\mathcal{D}=\{\mathcal{D}_a|\ a\in\Theta\}$ and an *interpretation* function $[\![\cdot]\!]$ such that:

i. for all $A\in Con_a$, $[\![A]\!]\in\mathcal{D}_a$

ii. for all $\mathsf{i}=\langle \mathsf{i}_1, \mathsf{i}_2\rangle\in\mathcal{D}_s$: $[\![\top]\!](\mathsf{i})\doteq(\mathsf{i}_1)_1$, $[\![\top']\!](\mathsf{i})\doteq(\mathsf{i}_1)_2$, $[\![\bot]\!](\mathsf{i})\doteq(\mathsf{i}_2)_1$, $[\![\bot']\!](\mathsf{i})\doteq(\mathsf{i}_2)_2$
(Notation: '$X\doteq Y$' abbreviates '$X=Y$, if Y is defined; else, X is undefined')

DEFINITION 4 (UC_0 *syntax*) For any type $a\in\Theta$, define the set of *a-terms*, $Term_a$:

i.	$A\in Term_a$	, if $A\in Con_a\cup Var_a$
ii.	$(A=B)\in Term_t$	, if $A, B\in Term_a$
iii.	$\neg A\in Term_t$	, if $A\in Term_t$
vi.	$(A\wedge B)\in Term_t$	, if $A, B\in Term_t$
v.	$\exists u_a B\in Term_t$	, if $u_a\in Var_a$ and $B\in Term_t$
vi.	$\lambda u_a(B)\in Term_{(ab)}$	, if $u_a\in Var_a$ and $B\in Term_b$
vii.	$BA\in Term_b$	, if $B\in Term_{(ab)}$ and $A\in Term_a$
viii.	$(A\ ^{\top}\!\bullet B), (A\ ^{\bot}\!\bullet B)\in Term_s$	, if $A\in Term_e$ and $B\in Term_s$

DRT-STYLE ABBREVIATIONS

i. Projections (type *se*)

A_e°	:=	$\lambda i_s(A)$
A_{se}°	:=	$\lambda i_s(Ai)$

ii. Conditions (type *st*)

$B\langle A_1,\ldots,A_n\rangle$	:=	$\lambda i_s(B\ A_1^\circ i,\ \ldots,\ A_n^\circ i)$
$(A_{se}=_i B_{se})$	:=	$\lambda i_s(A^\circ i = B^\circ i)$

iii. Updates (type (*st*)*st*)

$[C_{st}]$	:=	$\lambda I_{st}\lambda j_s(Ij\wedge Cj)$
$[x_e\|\ C_{st}]$	:=	$\lambda I_{st}\lambda j_s(\exists x_e\exists i_s(Ii\wedge Ci\wedge j=x\ ^{\bot}\!\bullet i)$
$^{\top}[x_e\|\ C_{st}]$	:=	$\lambda I_{st}\lambda j_s(\exists x_e\exists i_s(Ii\wedge Ci\wedge j=x\ ^{\top}\!\bullet i)$
$(K_1;\ K_2)$	:=	$\lambda I_{st}\lambda j_s(K_2\ (K_1 I)\ j)$

DEFINITION 5 (UC_0 *semantics*). For any $\mathcal{M}=\langle\mathcal{D}, [\![\cdot]\!]\rangle$ and $\mathcal{M}$-assignment g, define:

i.	$[\![A]\!]^g$	=	$[\![A]\!]$	, if $A\in Con_a$	
		=	$g(A)$	, if $A\in Var_a$	
ii.	$[\![(A=B)]\!]^g$	=	1	, if $[\![A]\!]^g=[\![B]\!]^g$	; else, = 0
iii.	$[\![\neg A]\!]^g$	=	1	, if $[\![A]\!]^g=0$	; else, = 0
iv.	$[\![(A\wedge B)]\!]^g$	=	1	, if $[\![A]\!]^g=1$ and $[\![B]\!]^g=1$	; else, = 0
v.	$[\![\exists u_a(B)]\!]^g$	=	1	, if $\{\mathsf{d}\in\mathcal{D}_a\|\ [\![B]\!]^{g[u/\mathsf{d}]}=1\}\neq\varnothing$	; else, = 0
vi.	$[\![\lambda u_a(B)]\!]^g(d)$	$\doteq$	$[\![B]\!]^{g[u/\mathsf{d}]}$	, for any $\mathsf{d}\in\mathcal{D}_a$	
vii.	$[\![BA]\!]^g$	$\doteq$	$[\![B]\!]^g([\![A]\!]^g)$		
viii.	$[\![(A\ ^{\top}\!\bullet B)]\!]^g$	$\doteq$	$\langle([\![A]\!]^g\cdot \mathsf{i}_1), \mathsf{i}_2\rangle$	, if $[\![B]\!]^g=\langle \mathsf{i}_1, \mathsf{i}_2\rangle$	
	$[\![(A\ ^{\bot}\!\bullet B)]\!]^g$	$\doteq$	$\langle \mathsf{i}_1, ([\![A]\!]^g\cdot \mathsf{i}_2)\rangle$	(Notation: $\mathsf{d}\cdot\langle \mathsf{d}_1,\ldots,\mathsf{d}_n\rangle := \langle \mathsf{d}, \mathsf{d}_1,\ldots,\mathsf{d}_n\rangle$)	

DEFINITION 6. An (*st*)*st*-term K is *true* on $\mathcal{M}$ given input $\mathsf{c}\in\mathcal{D}_{st}$, iff $\forall g$: $[\![\exists j\ KIj]\!]^{g[I/\mathsf{c}]}=1$

References

Anand, P., and A. Nevins. 2004. Shifty operators in changing contexts. In *Proceedings from SALT XIV*, 20–37. CLC, Cornell University, Ithaca.

Bittner, M. 2001. Surface composition as bridging. *Journal of Semantics* 18:127–177.

Bittner, M. 2007. Online update: Temporal, modal, and *de se* anaphora in polysynthetic discourse. In *Direct compositionality*, ed. C. Barker and P. Jacobson, 363–404. Oxford: Oxford University Press.

Bittner, M. 2011. Time and modality without tenses or modals. In *Tense across Languages*, ed. R. Musan and M. Rathert, 147–188. Tübingen: Niemeyer.

Chierchia, G. 1989. Anaphora and attitudes *de se.* In *Semantics and Contextual Expression*, ed. R. Bartsch *et al.*, 1–31. Dordrecht: Foris.

Dekker, P. 1994. Predicate Logic with Anaphora. In *Proceedings from SALT IV*, 79–95. DMLL, Cornell University, Ithaca.

Grosz, B. A. Joshi, and S. Weinstein. 1995. Centering: A framework for modeling the local coherence of discourse. *Computational Linguistics* 21:203–225.

Jelinek, E. 1984. Empty categories, case, and configurationality. *Natural Language & Linguistic Theory* 2:39–76.

Kamp, H. 1985. Context, thought, and communication. *Proceedings of the Aristotelian Society*, New Series 85:239–261.

Kaplan, D. 1979. On the logic of demonstratives. *Journal of Philosophical Logic* 8:81–98.

Lewis, D. 1979. Attitudes *de dicto* and *de se. The Philosophical Review* 88:418–446.

Moens, M. and M. Steedman. 1988. Temporal ontology and temporal reference. *Computational Linguistics* 14:15–28.

Muskens, R. 1995. Tense and the logic of change. In *Lexical Knowledge in the Organization of Language*, ed. U. Egli *et al.*, 147–183. Amsterdam: John Benjamins.

Rice, K. 1986. Some remarks on direct and indirect discourse in Slave (Northern Athapaskan). In *Direct and Indirect Speech*, ed. F. Coulmas, 47–76. Berlin: de Gruyter

Schlenker, P. 2003. A plea for monsters. *Linguistics and Philosophy* 26:29–120.

Speas, M. 1999. Person and point of view in Navajo direct discourse complements. UMOP 24, 259–273.

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

Veltman, F. 1996. Defaults in update semantics. *Journal of Philosophical Logic* 25:221–261.

Webber, B. 1988. Tense as discourse anaphor. *Computational Linguistics* 14:61–73.

Zeevat, H. 1999. Demonstratives in discourse. *Journal of Semantics* 16:279–314.

Department of Linguistics
18 Seminary Place
Rutgers University
New Brunswick, NJ 08901

mbittner@rci.rutgers.edu