

Uncentered attitude reports

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Abstract. I argue for a semantic distinction between two classes of attitude complements. One class is best modeled in terms of possible worlds compatible with what the attitude holder believes/says, in the tradition of Hintikka 1969. The other is best modeled in terms of centered worlds representing the *de se* perspective of the attitude holder, in the tradition of Chierchia 1989 (in turn inspired by Lewis 1979). Much work has assumed that all attitude complements are to be treated semantically in this second manner (Schlenker 1999, Anand 2006, Grønn and von Stechow 2010, Pearson 2015, i.a.). I refer to this hypothesis as *Uniformity*. Uniformity predicts that all attitude complements should be equally semantically able to host elements that must refer *de se*, such as shifted first person indexicals or relative tenses. Drawing on new evidence from Nez Perce, I demonstrate that this prediction is false, and argue that the best explanation for the distribution of dedicated *de se* elements comes from variation in whether attitude complements denote sets of centered tuples or rather sets of possible worlds.

1 Introduction

Studies of attitude reports in a variety of languages have uncovered elements that require interpretation *de se*, e.g. controlled PRO (Morgan 1970, Chierchia 1989), (certain) logophors (Schlenker 1999, Anand 2006, Haida 2009, Bassi et al. 2023; cf. Pearson 2015, Bimpeh 2023, Akolkar and Hien 2024), certain shifty indexicals (Anand 2006, Sudo 2012, Deal 2020), and relative tenses (Heim 1994, von Stechow 1995, Abusch 1997). Approaches to these phenomena standardly feature a revision to the Hintikka picture of attitudes as involving quantification merely over possible worlds, and the corresponding standard assumption that complement clauses express propositions (sets of worlds). Rather, attitude reports involve quantification over *centered* worlds, which can be modelled as tuples $\langle x, t, w \rangle$ of an individual, a time, and a world; complement clauses denote sets of such tuples. A sample centered analysis for *believe* is given in (1).¹ In the complement of such a verb, an element will be read *de se* if it is translated with a variable bound by the quantification over individuals or times. A dedicated *de se* element is one that must be translated in this way.

- (1) $\llbracket \text{believe} \rrbracket^{c,i} = \lambda P_{\langle e \times i \times s, t \rangle} . \lambda e . \lambda x . \forall \langle y, t', w' \rangle \in DOX(x, \tau(e), w_i) : P(\langle y, t', w' \rangle) = 1$
Where $\langle y, t', w' \rangle \in DOX(x, t, w)$ iff x believes in w at t that they might be y in w' at t' .

¹ Here and throughout I make use of a double-indexed semantics featuring interpretation with respect to a context and an index (in addition to a variable assignment, usually omitted); I spell out further assumptions related to this implementation below. I also assume that the attitude verb has an event argument. The basic notion of centered attitude predicates in no way depends on these particular choices, however. See e.g. Grønn and von Stechow 2010, Pearson 2015 for versions in terms of only object-language variables over worlds and times, and without events.

The argument for recognizing dedicated *de se* elements of natural language—and accordingly, centering—comes from a familiar mix of linguistic data and inference to the best explanation. The data come from interpretations of, say, shifty indexicals or relative tenses, and the inference comes from ruling out, say, special restrictions on *de re* semantics that would allow us to capture the *de se*-only pattern without specific appeal to individual and temporal centers in the analysis of the complement clause (as per Boër and Lycan 1980, Reinhart 1990, Maier 2009, 2011; see discussion in Chierchia 1989, Percus and Sauerland 2003, Anand 2006, Pearson 2018).

Once these arguments for verb meanings like (1) are adopted, questions arise about their scope. A natural hypothesis is *Uniformity*:

(2) Uniformity

Attitude predicates always involve centered quantification. Attitude complements always denote sets of centered tuples, never merely sets of worlds, whether or not they contain visible *de se* elements.

Works that suggest a commitment to Uniformity include, among others, Schlenker (1999), Ogihara (1999), von Stechow (2003), Anand (2006), Grønn and von Stechow (2010), and Pearson (2015, 2021). The following passages are illustrative: “Let us assume that attitude predicate complements are sets of centered worlds, which are triples of individuals, worlds, and times, corresponding to the attitude-holder’s *de se* coordinates” (Anand 2006, 11). “An attitude verb (e.g., *think*) or an indirect discourse verb (e.g., *say*) denotes a relation between individuals and properties (i.e., sets of world-time-individual triples) . . . Then when someone says “I believe ϕ ,” this utterance is understood to mean that the speaker self-ascribes the property denoted by ϕ ” (Ogihara 1999, §3.1). It should be pointed out that all of the authors just cited discuss multiple predicates in multiple languages; no restriction on the scope of Uniformity only to certain predicates (or certain languages) is implied. To the contrary, these works suggest that, at the limit, if a complement contains no *de se* elements at all, quantification over individuals and times as in (1) is harmlessly vacuous. It simply happens that nothing references the relevant bound values.

In this paper I take up the question of Uniformity as a potential empirical universal about attitude semantics. I begin with a point of concurrence with the authors just cited: Uniformity is an excellent null hypothesis. However, it is considerably less attractive as a dogma. We ought to be open to evidence that bears on the question of whether indeed all attitude reports are centered. Of course, given the possibility of vacuity just mentioned, it may seem that arguing for centered reports is much more straightforward than arguing for uncentered ones: to show that an attitude report is centered, we look for the presence of familiar obligatorily *de se* elements (e.g. shifty indexicals), but the *absence* of these elements in a given attitude report does not show us that a centering hypothesis should be abandoned. I aim to show, nevertheless, that the cause is not hopeless. Just as in the case of centering, arguments from a mix of linguistic evidence and inference to the best explanation are available in the case of uncentered attitudes as well. In particular, I will argue that for certain attitude reports expressed in a natural language, the best explanation for the systematic absence of multiple types of dedicated *de se* elements comes from the attitude report remaining uncentered. In this respect, I conclude, there is variation: while some attitude complements indeed are best treated as sets of centered tuples, others are best treated in the original Hintikka style as sets of possible worlds. Dedicated *de se* elements are available in complements in the former class, but not the latter class.

This conclusion partially reprises ideas from Chierchia’s (1989) discussion of predicate types and subcategorization. For Chierchia, the attitude predicates of English vary in whether they require centering. Certain attitude predicates always take properties (in our terms: centered propositions, or sets of centered tuples) as their arguments. These are the predicates that compose with nonfinite complements, the subject of which must be *de se* PRO. By contrast, English *that*-clause attitude reports are ambiguous: the clausal complement may express either a property (if it contains a pronoun read *de se*) or a proposition (otherwise). Accordingly, attitude predicates that combine with such clauses are themselves ambiguous. They may either compose with a centered complement, as in (1), or an uncentered one. In the latter case, a natural assumption is that the doxastic alternativeness relation reverts to a version much closer to that envisioned by Hintikka 1969 (in reference to whom I indicate the relation here as DOX^h):

$$(3) \quad \llbracket believe_{uncent} \rrbracket^{c,i} = \lambda p_{\langle s,t \rangle} . \lambda e . \lambda x . \forall w' \in DOX^h(x, \tau(e), w_i) : p(w') = 1 \quad (v.1)$$

Where $w' \in DOX^h(x, t, w)$ iff w' is compatible with what x thinks in w at t .²

It should be clear that (3) violates Uniformity, both as relates to the predicate and as relates to its complement. A ready alternative, of course, violates Uniformity as it relates to the semantics of the complement, but observes it as relates to the quantification expressed by the verb itself (with the help of vacuous quantification over individuals and times):

$$(4) \quad \llbracket believe_{uncent} \rrbracket^{c,i} = \lambda p_{\langle s,t \rangle} . \lambda e . \lambda x . \forall \langle y, t', w' \rangle \in DOX(x, \tau(e), w_i) : p(w') = 1 \quad (v.2)$$

The present proposal might be approached by considering what would happen if an attitude predicate were *unambiguously* to have a semantics like (3) or (4). Let us call such a hypothetical predicate *believe**. Consider the different predictions that arise for centered *believe* vs. uncentered *believe** in cases where the complement contains a dedicated *de se* element—a shifty first person indexical, for instance, required to be bound by centered quantification over individuals, or a relative tense, required to be bound by centered quantification over times. (Let us assume for the sake of argument that both types of elements require interpretation *de se*.) If English had such elements, we would expect them to happily occupy the complement of *believe*, producing centered propositions with no vacuous binding, as in (5).

$$(5) \quad \llbracket that I_{shifty} am_{relative} late \rrbracket^{c,i} = \lambda \langle y, t', w' \rangle . y \text{ is late at } t' \text{ in } w'$$

But *believe** is a different creature. Whether we adopt (3) or (4), its complement is merely propositional, and thus there is no abstraction over individuals or times to bind an individual or temporal variable. If shifty first person indexicals and relative tenses must be so bound, we expect them to be strictly absent from complements of *believe**:

$$(6) \quad * \text{ Tara believed* that } I_{shifty} am_{relative} late.$$

It is this inability to host dedicated *de se* devices that would provide our evidence for uncentered attitude reports—and thus our best route to an empirical argument against Uniformity.

In the rest of this paper, I present an argument of exactly this type. So far I have spoken of hypothetical variants of English which, in addition to the fictional verb *believe**, contain shifty first

² A more Lewis-style statement is also possible here, based on the idea of self-location in logical space: $w' \in DOX^h(x, t, w)$ iff x thinks in w at t that she might be in w' .

person indexicals and relative tenses; English itself lacks these. Therefore, my argument will not come from English. It will come from Nez Perce, a language with *de se* shifty person indexicals and relative tenses—but only in certain attitude complements, not others. In the next two sections, I first introduce a split between two kinds of complement clauses, together with a pair of dedicated *de se* phenomena, namely shifty person indexicals and relative tenses (§2). I then show that these phenomena are confined to one kind of complement clause only (§3). In sections 4 and 5, I show how this distribution can be captured by recognizing two classes of attitude complements in Nez Perce: a centered class, which obeys Uniformity, and an uncentered class, which does not. Consequences of this proposal for the analysis of attitude reports *de re* are explored in section 6; in particular, as we will see, the postulation of uncentered complement clauses provides some reason to favor *res*-movement theories (Heim 1994, Abusch 1997) and/or revisionist theories (Gennari 2003, Blumberg and Lederman 2021, Tancredi and Sharvit 2022, Benbaji-Elhadad 2023, Mayr and Schmitt 2023) over those based on Concept Generators (Percus and Sauerland 2003, Anand 2006, Charlow and Sharvit 2014, Pearson 2015, Baron 2015). In section 7, I argue against two alternative, Uniformity-obeying analyses of the Nez Perce data: one which attributes the difference between attitude reports that allow and disallow *de se* phenomena strictly to the syntax of the attitude complement, without any relevant difference in the semantics; and one which treats factivity, not centering, as the core semantic property responsible for regulating the distribution of *de se* phenomena. In section 8, I present a brief conclusion.

There are two small notes to be made before turning to these arguments. First, before leaving the discussion of English entirely, it should be noted that the arguments given above do not amount to an endorsement of Chierchia’s (1989) claims concerning the attitudinal lexicon of English. While I do adopt from Chierchia the central idea that attitude reports may differ in whether they involve centering, I do not see a clear way to assess his particular hypothesis that English finite attitude complements sometimes, but not always, feature centering. This is because the sole dedicated *de se* device in English, PRO, is not available in finite clauses.³ Thus while a case may be made that pronouns in finite complements in English may indeed be bound by centered quantification over individuals (see esp. Percus and Sauerland 2003), there is no ready way to assess whether this centered quantification is present *always* (as Uniformity would have it) or merely *sometimes*, just in the cases where it is useful semantically (as per Chierchia). Regardless of centering, PRO will be unavailable in finite clauses for syntactic reasons—presumably at least in part the same reasons that restrict it, in non-finite clauses, to subject position. If we had only evidence from English, then, we would have no way to empirically assess Uniformity. So much more the reason to look to a language with a richer array of dedicated *de se* phenomena.

Second: it might be thought that the postulation of uncentered attitude reports runs afoul of argumentation from the philosophical literature on *de se*, in particular Lewis 1979, given Lewis’ well-known argument that all attitudes are indeed attitudes *de se*. But this worry would be misplaced. Lewis himself is careful to distinguish between attitudes themselves (which he seeks to analyze) versus the semantics of attitude reports (which he does not); see Lewis 1979, 541 as well as similar remarks in Stalnaker 1981, Schlenker 1999, 71, among others. In view of this distinction, it should be emphasized that Uniformity, the topic of this paper, is a semantic claim about attitude predicates and their complements. No contradiction arises for those who wish to adopt

³ Moreover, *de re* readings in finite clauses may be analyzed in multiple ways, as discussed in section 6, not all of which require that the complement clause provide a set of centered worlds.

Now, to the main event.

In this section I introduce a split between two types of complementation patterns in Nez Perce, a Sahaptian language indigenous to the Columbia Plateau region of Idaho, Washington, and Oregon, USA. Unless otherwise cited, the data in this paper come from my fieldwork conducted on the Nez Perce Reservation in Lapwai, Idaho, with native speaker consultants Bessie Scott and Florene Davis, between 2006 and 2019. Elicitation protocols were designed following Matthewson 2004 and Tonhauser et al. 2013, with the primary data collection methods being felicity judgment tasks, inference tasks, translation between English and Nez Perce, and production tasks. (Data points obtained via various of these methodologies are indicated below.) This work builds on prior research describing various aspects of Nez Perce grammar, including general descriptive background in Aoki 1970, 1994, Rude 1985 *et seq.*, Crook 1999, and Deal 2010b *et seq.*; research specifically addressing Nez Perce attitude verbs and complementation patterns, including Deal 2009, 2017a, 2018a, 2020, 2024; and research specifically addressing Nez Perce *de se* phenomena—in particular, shifty indexicals—including Deal 2009, 2014, 2017b, 2020. Here, I introduce basic data on complementation patterns (§2.1) and *de se* phenomena (§2.2, §2.3), building and expanding on this prior work, before turning to new data concerning their interaction in §3.

Nez Perce allows two main types of finite complement clauses, with the choice between them determined by the embedding verb (Deal 2018a). The first type is simply a matrix-like clause with no distinctive morphosyntactic marks for subordination, (7a); note identical morphosyntax in the matrix clause version (7b). Complements of this type are found with the verbs *neki* ‘think’, *hi* ‘say/tell’, and *cuukwe* ‘know’. I will refer to this complementation type as *simplex embedding*.⁴

- (7) a. Beth hi-neki-se-∅ [Jill-nim pee-siw'e-nu' Matt-ne].
Beth.NOM 3SUBJ-think-IMPRF-PRES [Jill-ERG 3/3-not.recognize-PROSP Matt-ACC]
Beth thinks that Jill won't recognize Matt.

5

- b. Jill-nim pee-siw'e-nu' Matt-ne.
 Jill-ERG 3/3-not.recognize-PROSP Matt-ACC
 Jill won't recognize Matt.

The second type features two obligatory, distinctive morphemes that must appear at the left edge of the complement clause: *yo̘* and *ke*. Both elements are familiar from relative clauses, where *yo̘* is a (nominative) relative pronoun and *ke* is a complementizer (Deal 2016, 2024). This type of complement clause thus strongly resembles a relative clause in its morphological marking. Following Caponigro and Polinsky (2011) and Deal (2024), I will refer to this complementation strategy as *relative embedding*. Compare the marking of the attitude report in (8) to the relative clause in (9).

- (8) Watiisx Meeli hi-llooy-ca-qa [yo̘ ke kine picpic
 1.day.away Mary.NOM 3SUBJ-be.happy-IMPERF-REC.PAST [RP.NOM C here cat.NOM
 hi-pnim-sa-qa].
 3SUBJ-sleep-IMPERF-REC.PAST]
 Yesterday Mary was happy that the cat was sleeping here.
- (9) Mine hii-wes picpic [yo̘₁ ke kine t₁
 where 3SUBJ-be.PRES cat.NOM [RP.NOM C here
 hi-pinmix-sa-qa]?
 3SUBJ-go.to.sleep-IMPERF-REC.PAST]
 Where is the cat that was sleeping here?

Relative embedding occurs with a larger set of attitude verbs than does simplex embedding. These are primarily verbs whose English translations would be classified as (emotive) factives, including *lilooy* 'be happy', *'etqew* 'be sad', *cicwaay* 'be surprised', *'eey's* 'be joyful', and *q'eese* 'be bothered/unhappy', though it also includes *timiipni* 'remember', a cognitive factive, and *tim'neenek* 'be worried/anxious', whose English translation is not factive at all.⁵ As discussed in section 7, these Nez Perce verbs all indeed give rise to the inference pattern characteristic of factivity—but the same pattern is also found with *cuukwe* 'know', which takes a simplex complement.

The syntax of Nez Perce relative embedding is discussed in Deal 2024. While syntactic matters are not my primary interest here, I will mention two aspects of relative embedding syntax that support the semantic characterization I will put forward. A first point is that the relative embedding structure involves true subordination; the clausal constituent is not merely in a relation of apposition to the main clause. (Evidence for this comes from Condition C effects; see Deal 2024.) Second, relative embeddings show signs of lacking any nominal superstructure. Rather, the complement appears to be simply a CP.⁶ One important difference with NP/DP objects concerns simple selection: most verbs that allow relative embeddings do not allow NP/DP objects. This is shown below for *'eey's* 'be joyful'.⁷

⁵ Evidence that these predicates are indeed verbs and not adjectives comes from several aspects of their morphosyntax, as discussed in Deal (2024). First, they inflect for the person and number of their subject. Second, they are used predicatively without a copula. Third, they inflect for TAM.

⁶ Since relative embeddings are quite understudied crosslinguistically, I will point out that the facts just below are markedly different from what Caponigro and Polinsky (2011) report regarding relative embeddings in Adyghe.

⁷ Nez Perce allows both nominative/nominative and ergative/accusative case frames in transitives.

- (10) a. *pro* he-’eey’s-ce- \emptyset [yo \hat{x} ke *pro* hi-pa-paay-n- \emptyset].
 3SG 3SUBJ-be.joyful-IMPRF-PRS [RP.NOM C 3PL 3SUBJ-S.PL-arrive-P-PRES]
 ‘She’s joyful that they arrived.’
- b. *Naaqc-nim qiiwn-e pe-’eey’s-ce- \emptyset .
 one-ERG old.man-ACC 3/3-be.joyful-IMPERF-PRES
 Intended: ‘Someone is joyful about the old man.’
- c. **pro* he-’eey’s-ce- \emptyset titwaatit.
 3SG 3SUBJ-be.joyful-IMPERF-PRES story.NOM
 Intended: ‘S/he is joyful about a story.’

Relatedly, it is not possible to prefix a noun to a relative embedding:

- (11) *pro* hi-llooy-ca- \emptyset (*tamtayn) [yo \hat{x} ke Angel
 3SG 3SUBJ-be.happy-IMPERF-PRES (*news.NOM) [RP.NOM C Angel.NOM
 hi-wehye- \emptyset -m- \emptyset]
 3SUBJ-arrive-P-CIS-PRES]
 S/he is happy (intended: about the news) that Angel will arrive.

Based on this and other syntactic evidence, Deal (2024) argues that Nez Perce relative embedding complements are CPs wherein a relative operator moves to Spec,CP from a high position (above TP). In this paper I will focus primarily on the question of what sort of semantic object the complement clause provides to the attitudinal quantifier—a traditional proposition, or a centered proposition—and largely (modulo a few brief remarks in section 5) set aside questions related to the internal compositional semantics of the complement clause.

2.2 Indexical shift

Nez Perce attitude complements may contain two types of elements which require interpretation *de se*: shifted first (and second) person pronouns and relative tenses. Notably, the language also allows shifty locative indexicals, but these impose no *de se* requirement (Deal 2014, 2020).⁸ As we will see below, there is a clear interaction between dedicated *de se* phenomena and complement type: simplex embedding allows *de se* phenomena and relative embedding does not. In this section and the next, I introduce indexical shift and relative tense patterns in simplex embedding only, in preparation for discussion of the interaction with complement type in section 3.

The basic behaviors of indexical shift in Nez Perce are documented in Deal 2009, 2014, 2020. This work establishes the following generalizations. First, both first person pronouns and locative adverbial indexicals may shift.⁹ Shift of a first person pronoun, *’iin*, is demonstrated in (12). (This

As (10b,c) show, *’eey’s* ‘be joyful’ does not permit a nominal object under either case frame. On Nez Perce case, see Deal 2010a,b.

⁸ Nez Perce is not unique in allowing shifty indexicals that lack a *de se* requirement. See Sudo (2012), Nishiguchi (2017), and the typological discussion in Deal (2020, §3.1.4).

⁹ So too may second person pronouns, though I set these aside here. See Deal (2020) for discussion. Observe that temporal adverbial indexicals are left off of this list. Deal (2014) notes that Nez Perce translation equivalents of ‘yesterday/tomorrow’ and ‘today’ are not truly indexical. I am not aware of any truly indexical temporal adverbs in the language.

example is somewhat unusual in having a pronominal subject that is overt; however, overt and null pronominals show the same shifting behavior. Shift of a null first person pronoun, where the first person status of the missing argument is indicated by verbal inflection, is demonstrated in (19) and (21).) Shift of a locative adverbial indexical, *kine* ‘here’, is demonstrated in (13).

- (12) Kii hii-wes ’iniit [*RelClause* yoŋ₁ ke Jack
 this.NOM 3SUBJ-be.PRES house.NOM [RP.NOM C Jack
 hi-neki-se-Ø [’iin Ø-hani-Ø-ya *t*₁]].
 3SUBJ-think-IMPERF-PRES [1SG.NOM 1SUBJ-make-P-REM.PAST]]
 This is the house that Jack_i thinks he_i (lit: ‘I’) built.

- (13) Context: Elicited in Lapwai, ID. Lewiston is the closest major city.

Miniku cewcewin’es₂ *pro* hi-i-caa-qa Simiinikem-pe [*t*₂
 which phone.NOM 3SG 3SUBJ-say-IMPERF-REC.PAST Lewiston-LOC [
 hi-muu-no’qa kinix met’u weet’u *t*₂ hi-muu-no’qa koníx] ?
 3SUBJ-call-MODAL from.here but NEG 3SUBJ-call-MODAL from.there] ?
 Which phone did they say in Lewiston can call from Lewiston (lit. ‘here’) but not from
 Lapwai (lit. ‘there’)?

Second, as these examples also show, clauses that host indexical shift may be the origin site of *wh*-movement and relativization, unlike clausal quotations.¹⁰

Third, indexical shift shows the pattern that Anand and Nevins (2004) call ‘Shift Together’: within a given attitude report, either all clausemate first person pronouns shift, or none do. On the most natural reading of sentence (14), both instances of embedded first person are shifty (and thus refer to my sister). Also possible is a reading where neither is shifty, and thus both simply refer to me. But it is entirely impossible for one to be shifty while the other remains unshifted.¹¹

¹⁰ Compare for instance the English question in (i):

- (i) * Who did Mary say, “I handed the bag to _”?
 cf. Who did Mary say she handed the bag to _?

Quotation shows opacity to extraction at the clausal level, whereas clauses containing indexical shift do not. Additional arguments against a quotation analysis for Nez Perce indexical shift are given in Deal (2020, ch 2).

¹¹ Nez Perce speakers often prefer shifty interpretations in cases where they are pragmatically possible; this preference is perhaps especially strong in speech reports. Note that, in spite of this preference, there is a clear distinction in consultant reactions to fully unshifty interpretation (14b) (which is possible, though dispreferred) versus mixed interpretations (14c)/(14d), which are entirely unavailable.

- (14) Ne-’níc-em pee-Ø-n-e ’in-haama-na,
 1SG-older.sister-ERG 3/3-say-P-REM.PAST 1SG-husband-ACC
 [’iin-im ciq’aamqal hi-twehkey’k-Ø-e ’iin-e].
 [1SG-GEN dog(ERG) 3SUBJ-chase-P-REM.PAST 1SG-ACC]
 a. My sister_s told my husband_h that her_s dog chased her_s.
 b. ? My sister_s told my husband_h that my dog chased me.
 c. ✗ My sister_s told my husband_h that my dog chased her_s.
 d. ✗ My sister_s told my husband_h that her_s dog chased me.

The same holds for pairs of locative indexicals. Because both locative indexicals in (15) must refer to the same location, the only reading of the sentence is one where it reports the utterance of a contradiction (namely, that a single place is hotter than itself):

- (15) # ’In-lawtiwaa-nm paasxa-pa hi-hi-n-e *pro*, [kine hii-wes qetu
 my-friend-ERG Boise-LOC 3SUBJ-say-P-REM.PAST 1SG [here 3SUBJ-be.PRES more
 ’iyeeqis kin-ix].
 hot here-from]
 a. ✗ My friend in Boise told me it was hotter here than there.
 b. ✗ My friend in Boise told me it was hotter there than here.

We return to the question of a Shift Together effect holding between person and locative indexicals around (19) below.

Fourth, shifty first person, but not shifty locative *kine* ‘here’, must be read *de se*. In the case of first persons, the mere fact of reference to the attitude holder within the attitude report is not sufficient to license the use of the shifty indexical. When this is purely reference *de re*, shifty first person is rejected. (This fact is parallel to data reported on shifty first person indexicals in a diverse range of languages, including Amharic (Anand 2006, 79), Farsi (Anvari 2019, 91-92), Korean (Park 2016, (26)), Marathi (Akolkar 2024), Uyghur (Sudo 2012, 224-5) and Zazaki (Anand 2006, 79).)

- (16) Context: A lady gets very sick and then recovers. Her recovery is so miraculous that they mention it on TV. They show the lady in a very ill condition; she looks awful. She sees this TV report later and she doesn’t even recognize herself, she was so sickly at that time.¹²
 # ’Aayat hi-neki-se-Ø [*pro* k’oomay-ca-Ø].
 woman.NOM 3SUBJ-think-IMPERF-PRES [1SG be.sick-IMPERF-PRES]
 Intended: The woman_i thinks she_i is sick.

For shifty locative indexicals, however, no such requirement is in place. Reference to the attitude location *de re* is sufficient to license indexical shift. For the following context, we can specify

¹²This judgment holds regardless of whether the embedded verb bears present tense, as shown here, or past tense. Note that the first person status of the embedded subject is indicated here (as in numerous other examples) by the absence of third person morphology, notably the verbal prefix *hi-* (as well as the absence of second person clitics). On Nez Perce verb inflection, see Deal 2015b.

three distinct locations: the utterance location (Lapwai), the thinker's location (Clarkston), and the thinker's self-ascribed location (Asotin). The shifty indexical refers to the thinker's actual location (Clarkston), not to the place that she takes herself to be located (Asotin). (For an additional example of this type, see Deal 2014, (40).)

- (17) Context (elicited in Lapwai): Costco is a prominent store in Clarkston. Everyone knows where it is.

'Aayat hii-wes Clarkston-pa, met'u *pro* hi-neki-se- \emptyset
 woman 3SUBJ-be.PRES Clarkston-LOC but 3SG 3SUBJ-think-IMPERF-PRES
 Asootin-pa, kaa *pro* hi-neki-se- \emptyset [Costco hii-wes kine].
 Asotin-LOC and 3SG 3SUBJ-think-IMPERF-PRES [Costco 3SUBJ-be.PRES here]
 The woman is in Clarkston_i, but she thinks (she's) in Asotin, and she thinks Costco is here_i.

It does not seem likely that the acceptance of such sentences reflects confusion about the scenario, as no amount of reminding consultants about relevant aspects of the context changed their acceptance of this type of sentence. I therefore conclude that shifty locative indexicals in Nez Perce do not impose *de se* requirements—a finding that puts them in the company of a small group of indexical elements attested across various languages; see Sudo (2012), Nishiguchi (2017), Deal (2020, §3.1.4) for discussion of other cases.

Fifth, shift is optional both for indexical pronouns and for locatives, but the choice to shift or not shift indexical pronouns affects whether locative shift is possible. The optionality of shifting first persons is shown in (14a,b), repeated below. Speakers prefer but do not require the shifted interpretation of embedded first person.

- (18) Ne-'níc-em pee- \emptyset -n-e 'in-haama-na,
 1SG-older.sister-ERG 3/3-say-P-REM.PAST 1SG-husband-ACC
 ['iin-im ciq'aamqal hi-twehkey'k- \emptyset -e 'iin-e].
 [1SG-GEN dog(ERG) 3SUBJ-chase-P-REM.PAST 1SG-ACC]
 a. My sister_s told my husband_h that her_s dog chased her_s.
 b. ? My sister_s told my husband_h that my dog chased me.

The optionality of shifting locatives may be seen by contrasting examples with shifty readings, as in (13) and (17), with examples such as (19), where the locative remains unshifted (though its clausemate first person indexical *is* shifted):

- (19) Context: I travel to the town where my dad grew up and I go to the address he said he grew up at. Someone sees me looking at the house and I explain:

Na'-toot-am hi-i-cee-ne *pro* [kine *pro* tew'yenik- \emptyset -e].
 my-father-ERG 3SUBJ-say-IMPERF-REM.PAST 1SG [here 1SG live-P-REM.PAST]
 My father told me he used to live here.

Examples like (19) show that there is no Shift Together-type requirement holding between locative and person indexicals. Person shift is possible regardless of whether or not locative indexicals shift.¹³ However, this freedom does not hold in both directions: rather, locative shift requires

¹³For an example showing shift of both person nor locative indexicals, see Deal (2014, (23)); for an example in which both remain unshifted, see Deal (2014, (24)).

person shift. As (20) shows, when the attitude complement contains an unshifty first person, locative shift is not possible.

(20) Context: Harold is in Clarkston. I and my consultant are in Lapwai.

Paay's Harold hi-neki-se- \emptyset [*pro* wees kine Clarkston-pa].
 maybe Harold 3SUBJ-think-IMPERF-PRES [1SG be.PRES here Clarkston-LOC]
 Intended: Maybe Harold thinks_i that I am here_i in Clarkston_i.
 Consultant: "You could only say this if you were in Clarkston."

Finally, it should be noted that indexical shift is possible in the complements of all verbs that appear in a simplex embedding structure—*neki* 'think', *hi* 'say/tell', and *cuukwe* 'know'. We see shift in the complement of *neki* 'think' in (12) and (16)-(17) above, and in the complement of *hi* 'say/tell' in (13)-(15) above. Shift in the complement of *cuukwe* 'know' is shown in (21).

(21) 'Isii-ne Meeli hi-cuukwe-ce- \emptyset [*pro* 'e-ex-nu' _]?
 who-ACC Mary.NOM 3SUBJ-know-IMPERF-PRES [1SG 3OBJ-see-PROSP]
 Who does Mary know she's going to see?

2.3 Relative tense

Nez Perce verb morphology is highly polysynthetic and includes inflectional marking for tense as well as viewpoint aspect. Three tense categories may be distinguished: recent past *-qa*, remote past *-ne*, and present (unmarked).¹⁴ Note that the distinction between recent and remote past tense is collapsed in certain verb forms, though these will not be our emphasis here. This is generally the case for the copula (the tense inflection of which is, in addition, morphologically irregular); it is also the case in certain aspects, notably the aspectual category Deal 2010b calls "P aspect" (for perfect/perfective). The examples below feature the imperfective aspect, where all three tense morphemes are possible.

- (22) (*Waqiipa / *watiisx / taaqc) hi-weeqi-se- \emptyset .
 (while.back / 1.day.away / same.day) 3SUBJ-rain-IMPERF-PRES
 It is raining (*a while back / *yesterday / today)
- (23) (Waqiipa / watiisx / *taaqc) hi-waaqi-sa-qa.
 (while.back / 1.day.away / same.day) 3SUBJ-rain-IMPERF-REC.PAST
 It was raining (a short while back / yesterday / *today)
- (24) (Waqiipa / *watiisx / *taaqc) hi-weeqi-se-ne.
 (while.back / 1.day.away / same.day) 3SUBJ-rain-IMPERF-REM.PAST
 It was raining (a long while back / *yesterday / *today)

¹⁴I will assume here that present tense features a covert present tense morpheme, though this is not crucial for the analysis; see e.g. Ogiwara 1999 for an analysis of similar facts wherein present tense is treated simply as the absence of any tense at all. Of course, absence-of-tense views require some means of differentiating a language where the absence of tense always has a present interpretation, as in Nez Perce, from more radically tenseless (or "optionally tensed") languages in which the absence of tense is compatible with a wider range of interpretations. See Bochnak, Hohaus, and Mucha (2019) for relevant discussion and references.

As in many other languages, future marking is accomplished independent of the tense system proper. It is marked either via prospective aspect (*-(n)u'*) or via a “low future” suffix (*-tet'ee*) that nearly always co-occurs with imperfective aspect. (On the low future, see Deal 2010b, §1.7.4.3; on the prospective aspect, see Deal 2010b, ch 2-4 and note 15 below.)

Tense in simplex complement clauses replicates patterns familiar from non-sequence-of-tense languages such as Japanese (Ogihara 1989, 1995b, 1996, 1999, Kusumoto 1999, Kubota et al. 2009, Ogihara and Sharvit 2012). These patterns have not previously been documented, modulo some brief discussion in Deal 2009. Simultaneous readings must be conveyed with embedded present tense, regardless of whether the matrix tense is recent past (25) or remote past (26), or whether the matrix clause is future-marked with prospective aspect (27).

- (25) Context: On day 1, Mary says: “*pro* hi-weqi-yuu-se- \emptyset *pro*.”
 3SG 3SUBJ-rain-APPL-IMPERF-PRES 1SG
 (It’s raining on me.)

On day 2, I say to you:

- a. ✓ Meeli hi-i-caa-qa [*pro* hi-weqi-yuu-se- \emptyset *pro*]
 Mary 3SBJ-say-IMPERF-REC.PAST [3SG 3SUBJ-rain-APPL-IMPERF-PRES 1SG]
 (Mary said it was raining on her.)
- b. ✗ Meeli hi-i-caa-qa [*pro* hi-weqi-yuu-sa-qa *pro*]
 Mary 3SBJ-say-IMPERF-RC.PST [3SG 3SUBJ-rain-APPL-IMPERF-RC.PST 1SG]
- (26) *pro* hi-weeqi-se-ne met’u Meeli weet’u
 3SG 3SUBJ-rain-IMPERF-REM.PAST but Mary NEG
 hi-cuukwe-ce-ne [*pro* hi-weeqi-se- \emptyset].
 3SUBJ-know-IMPERF-REM.PAST [3SG 3SUBJ-rain-IMPERF-PRES]
 It was raining but Mary didn’t know that it was raining.
- (27) Weet’u Caan hi-cuukwe-nu’ [*pro* hi-weeqi-se- \emptyset].
 NEG John 3SUBJ-know-PROSP [3SG 3SUBJ-rain-IMPERF-PRES]
 (It will be raining but) John won’t know that it is raining.

Like in Japanese (Ogihara 1999), but unlike in English, embedding present under past does not lead to a “double access” reading, whereby the embedded eventuality description is connected to both the attitude time and the present moment (Smith 1978, p 66; Ogihara 1995a, Abusch 1997). Sentence (25a), with present embedded under recent past, does not imply that it is raining at present (nor that Mary claims it is). Similarly, sentence (28), with present embedded under remote past, may be appropriately said to someone who is known to be not currently pregnant.¹⁵

¹⁵ Additionally, present under prospective aspect, as in (27), also produces no inference concerning rain at the time of utterance; this type of fact also holds for present-under-future sentences in English. In English, a simultaneous reading of present-under-future is possible both in complement clauses and in relative clauses. In Nez Perce, by contrast, prospective aspect does not license simultaneous readings of present tense without an attitude verb, e.g. in relative clauses:

- (i) Kii pit’iin pamawa hi-haamany-o’ naaqc haama [*RelClause* ke ’ip-nim
 this girl someday 3SUBJ-marry.a.man-PROSP one man [C 3SG-ERG

- (28) *pro* nek-see-ne ['ee wees 'iluutpe]!
 1SG think-IMPERF-REM.PAST [2SG.CLITIC be.PRES pregnant]
 I thought you were pregnant!

These data show that embedded present tense receives a purely relative reading. Similar facts hold for other embedded tenses, as well as prospective aspect.¹⁶ That is, past tense embedded under past tense is interpreted as ‘backshifted’, as we see for matrix recent past in (29) and matrix remote past in (30).

- (29) Watiisx Caan-im hi-i-caa-qa *pro* [*pro*
 1.day.away John-ERG 3SUBJ-say-IMPERF-REC.PAST 1SG [3SG
 hi-k'oomay-ca-na / hi-k'oomay-ca-qa].
 3SUBJ-be.sick-IMPERF-REM.PAST / 3SUBJ-be.sick-IMPERF-REC.PAST]
 Yesterday, John told me he was sick.
 a. ✓ He said, "I was sick."
 b. ✗ He said, "I am sick."
- (30) Waqiipa Caan-im hi-i-cee-ne *pro* [ciq'aamqal
 while.back John-ERG 3SUBJ-say-IMPERF-REM.PAST 1SG [dog
 hi-k'oomay-ca-na / hi-k'oomay-ca-qa].
 3SUBJ-be.sick-IMPERF-REM.PAST / 3SUBJ-be.sick-IMPERF-REC.PAST]
 A while back, John told me the dog was sick.
 a. ✓ He said, "The dog was sick."
 b. ✗ He said, "The dog is sick."

And prospective aspect embedded under past tense, whether recent or remote, is interpreted as ‘forward-shifted’:

- (31) Meeywi tak'aynas-pa *pro* hi-i-caa-qa [hi-weeqi-yu'].
 morning TV-on 3SG 3SUBJ-say-IMPERF-REC.PAST [3SUBJ-rain-PROSP]
 This morning they said on TV it would be raining (now)
- (32) T. naaqc k'aayx-pa hi-i-cee-ne [*pro* cicyuuk'is hi-'np-u'
 T one week-LOC 3SUBJ-say-IMPERF-REM.PAST [3SG sugar 3SUBJ-buy-PROSP
 watiisx].
 1.day.away]
 Last week T. said he would buy sugar the next day.

pee-hetew'y-u' / # pee-hetew'i-se-∅].
 3/3-love-PROSP / 3/3-love-IMPERF-PRES]
 This girl will someday marry a man who loves her.
 Consultant comment on *pee-hetew'ise*: “[He] loves her now.”

¹⁶These facts (parallel to Mucha’s (2015) discussion of graded embedded tense in Medumba) challenge Cable’s (2015) generalization that “graded” tense systems resist purely relative readings.

The overall generalization is that all tenses, as well as prospective aspect, are interpreted in simplex complement clauses as indicating a temporal relation between a time associated with the embedded clause and a time associated with the reported attitude.

What is this latter time? As has frequently been noted in the description of other languages, Nez Perce embedded tenses (in simplex complements) are relative not to the actual time of the attitude itself—i.e. the time that thinking or saying takes place—but rather to the ‘internal now’ of the attitude holder, i.e. the time at which the attitude holder self-locates (von Stechow 1995, Abusch 1997, Kratzer 1998, Kubota et al. 2009, Grønn and von Stechow 2010, among many others). Relative tense thus falls under the general heading of *de se* phenomena. Accordingly, the mere fact of reference to the actual attitude time in the complement clause is not enough to license embedded present tense. This restriction is parallel to the restriction on shifty first person documented in (16). In (33), for instance, if the embedded present could refer to the attitude time *de re*, the last clause might be paraphrased as follows: he ascribes hotness to the day at which he is actually located. This reading is unavailable.¹⁷

- (33) Naaqc hi-neki-se-∅ [*pro* hii-wes halxpaawinaqit], metu' *pro*
 one 3SUBJ-think-IMPERF-PRES [3SG 3SG-be.PRES Monday] but 3SG
 hii-wes piilepti-pe ka'aw-pa, kaa *pro* hi-neki-se-∅ [kii taaqc
 3SG-be.PRES four-LOC day-LOC and 3SG 3SUBJ-think-IMPERF-PRES [this same.day
 hii-wes 'iyeeqis].
 3SUBJ-be.PRES hot]
 Someone thinks it's Monday, but it's Thursday, and he thinks that today is hot.
 a. ✓ He thinks: “Today is hot.”
 b. ✗ He thinks: “Thursday was/will be hot.”

Further evidence of the *de se* restriction on embedded present tense is shown in (34). The context for this example presents a speaker whose temporal self-location is incorrect: she self-locates on Sunday but is actually located on Saturday. Against this backdrop, the example contrasts two possible embedded clauses, both expressed with present tense (‘the post office is closed’ and ‘the post office is open’). If embedded present tense could indicate overlap with attitude time, ‘the post office is open’ should be an appropriate embedded clause: the post office is open on Saturday, which is when the attitude is held. But this clause is not felicitous. What is felicitous is a complement that holds of the time at which the attitude holder self-locates, viz ‘the post office is closed’.

¹⁷ Note that the source of the *de se* restriction in (33) is not the embedded adverbial *kii taaqc* ‘today’, as we see in (i). Here *kii taaqc* ‘today’ refers to the utterance day *de re*, the original report presumably having been of the form ‘I will go to Lewiston next week’. The embedded prospective aspect, however, remains relative to the internal now of the attitude report.

- (i) *pro* hi-i-cee-ne [*pro* Simiinikem kiy-u' kii taaqc]
 3SG 3SG-say-IMPERF-REM.PAST [1SG Lewiston go-PROSP this same.day]
 He said (last week) he was going to go to Lewiston today.

- (34) Context: One time, it was Saturday and I thought it was Sunday. I know that the post office is open on Saturday but closed on Sunday.

pro nek-see-ne, [tiim'es-nim 'iniit hii-wes ✓ wak'alpin' /
 1SG think-IMPERF-REM.PAST [letter-GEN house 3SUBJ-be.PRES closed /
 ✗ wa'alpin'].
 open]

I thought the post office was ✓ closed / ✗ open.

As above, the example cannot mean: I ascribed open-post-office status to the day on which I was actually located. Embedded present tense can only be read *de se*.

3 The interaction of complement type and *de se* phenomena

The behavior of (shifty) first person indexicals and (relative) tenses in simplex embedding provides support for a treatment of simplex embedding complements in terms of individually and temporally centered propositions (at least $\langle e \times i \times s, t \rangle$). Shifty first person indexicals must refer to the individual center; the temporal relations expressed by relative tenses must be calculated with respect to the temporal center. The facts from simplex embeddings thus present no challenge to Uniformity. Indeed, the general expectation to which Uniformity points is that all complements in the language should behave as simplex embedding complements do in terms of dedicated *de se* phenomena.

In this section, we review the evidence that this prediction is wrong. Relative embeddings behave sharply unlike simplex embeddings as far as dedicated *de se* phenomena are concerned: indexicals and tense alike receive only (unshifted, unbound) *de re* readings. I will show in section 5 how this restriction receives a semantic explanation on a view of relative embedding that departs from Uniformity.

3.1 No first person indexical shift in relative embedding

The first difference between relative and simplex embedding concerns embedded first person indexicals and the expression of classic attitudes *de se*. Unlike in simplex embedding, where shifty readings of first person pronouns are freely available (and indeed preferred, where pragmatically appropriate), shifty readings of first person pronouns are unavailable in relative embeddings. Only unshifty readings are permitted. This restriction is in place regardless of whether the first person pronoun is overt or null, and is insensitive to its syntactic position within the embedded clause. Thus the (b) interpretations are entirely unavailable for (35) and (36).¹⁸

¹⁸These examples show inflection on the complementizer particle *ke*. This inflection is found in all environments in which *ke* appears, including relative clauses and questions, and is obligatory; first and second persons are overtly indexed. See Deal 2015a, 2016.

- (35) *pro* hi-llooy-n-a [*yo* ke-x *pro* 'iyaa~~x~~-n-a *pro*
 3SG 3SUBJ-be.happy-P-REM.PAST [RP.NOM C-1 1SG find-P-REM.PAST 1SG.GEN
 siloo'ayn].
 glasses.NOM]
 a. ✓ She was happy I found my glasses.
 b. ✗ She was happy she found her glasses.
- (36) *pro* hi-'etqew-ce-~~0~~ [*yo* ke-x 'iin wi~~x~~ne-tet'ee-se-~~0~~].
 3SG 3SUBJ-be.sad-IMPERF-PRES [RP.NOM C-1 1SG leave-LOW.FUT-IMPERF-PRES]
 a. ✓ He's sad that I'm going to leave.
 b. ✗ He's sad that he's going to leave.

Whatever allows for the shifty *de se* reading is not available in relative complements. With first person shifty indexicals no longer an option, reference to the attitude holder within the complement clause requires third person:

- (37) *pro* hi-'etqew-ce-~~0~~ [*yo* ke *pro*
 3SG 3SUBJ-be.sad-IMPERF-PRES [RP.NOM C 3SG
 hi-wi~~x~~ne-tet'ee-se-~~0~~].
 3SUBJ-leave-LOW.FUT-IMPERF-PRES]
 He's sad that he's leaving.
- (38) *pro* hi-llooy-ca-~~0~~ [*yo* ke *pro* hi-'yaa~~x~~-n-a
 3SG 3SUBJ-be.happy-IMPERF-PRES [RP.NOM C 3SG 3SUBJ-find-P-REM.PAST
pro picpic].
 3SG.GEN cat.NOM]
 She's happy that she found her cat.

Note that this restriction is in place even though sentences (37) and (38) are most naturally interpreted (absent some explicit contextual information to the contrary) as describing attitudes *de se*. In terms of attitudes *de se*, what is different between simplex and relative embedding is not whether the attitude may be reported, but whether a dedicated *de se* device may be used to express it. The third person reporting strategy that must be used is certainly compatible with the report of an attitude *de se*, as in (37) and (38), but may also be used to report a non-*de se* attitude:¹⁹

¹⁹It is also possible to use embedded third person pronouns to report attitudes *de se* in simplex attitude reporting, as we see for the embedded third person object in (i):

- (i) Context: a student complains to the teacher that another student has hit him. The teacher approaches the accused and says: *Is it true that you hit this person?* ...
 'etke ki-nm hi-hi-n-e *pro* ['ee 'e-pt'e-~~0~~-ye
 because this.one-ERG 3SUBJ-say-P-REM.PAST 1SG [2SG.CLITIC 3OBJ-hit-P-REM.PAST
pro].
 3SG]
 ...because this one told me you hit him.

- (39) Context [same as (16)]: A lady gets very sick and then recovers. Her recovery is so miraculous that they mention it on TV. They show the lady in a very ill condition; she looks awful. She sees this TV report later and she doesn't even recognize herself, she was so sickly at that time.

'Aayat hi-neki-se- \emptyset [*pro* hi-k'oomay-ca- \emptyset].
 woman 3SUBJ-think-IMPERF-PRES [3SG 3SUBJ-be.sick-IMPERF-PRES]
 The woman_i thinks she_i is sick.

The overall range of interpretations of embedded third persons is readily captured on a view where embedded third person pronouns must always be read *de re*, and therefore allow *de se* readings as a special case (Boër and Lycan 1980, Reinhart 1990, Anand 2006, Maier 2011).

3.2 No relative tense in relative embedding

The second difference between relative and simplex embedding concerns embedded tense. A parallel generalization holds in this domain: relative interpretation of tense—a dedicated *de se* phenomenon found in simplex embedding—is not available in relative embeddings. To express a simultaneous reading with a past tense matrix clause, matching tenses must be used, rather than embedded present tense. As the following examples show, this is true both for recent and remote past tense.

- (40) *pro* hi-weeqi-se-ne met'u Meeli weet'u
 3SG 3SUBJ-rain-IMPERF-REM.PAST but Mary.NOM NEG
 hi-cciwaay-n-a [yo \hat{x} ke *pro* ✓ hi-weeqi-se-ne /
 3SUBJ-be.surprised-P-REM.PAST [RP.NOM C 3SG 3SUBJ-rain-IMPERF-REM.PAST /
 ✗ hi-weeqi-se- \emptyset].
 3SUBJ-rain-IMPERF-PRES]
 It was raining but Mary wasn't surprised that it was raining.

- (41) Watiisx Meeli hi-llooy-ca-qa [yo \hat{x} ke *pro*
 1.day.away Mary.NOM 3SUBJ-be.happy-IMPERF.REC.PAST [RP.NOM C 3SG
 ✓ hi-waaqi-sa-qa / ✗ hi-weeqi-se- \emptyset]
 3SUBJ-rain-IMPERF-REC.PAST / 3SUBJ-rain-IMPERF-PRES]
 Yesterday Mary was happy that it was raining (she was enjoying the rain).

A similar consequence of the absence of relative readings may be seen in the interpretation of past-under-past, thanks to the language's distinction between recent and remote past tense. For simplex embeddings, we saw above that either past tense may be embedded under the other, resulting in a backshifted reading. Notably, recent past tense may be embedded under remote past tense, (30). This possibility is not available in relative embeddings. Occurrence of a complement clause event slightly before (the internal now of) a remote past matrix attitude event is not sufficient to license the use of recent past tense:

A shifty first person indexical in fact cannot be used in this case, due to the fact that shifty first person and unshifty second person indexicals cannot be clausemates. See Anand and Nevins 2004, Anand 2006, Deal 2014, 2020 for discussion and analysis of this type of first+second person 'Shift Together' effect.

- (42) Kismis-pe kuleewit-pe, Meeli hi-llooy-ca-na [yoŋ
 Christmas-LOC evening-LOC Mary.NOM 3SUBJ-be.happy-IMPERF-REM.PAST [RP.NOM
 ke meeywi-pe miy'ac ✗ 'a-llooy-ca-qa /
 C morning-LOC child.NOM 3GEN-be.happy-IMPERF-REC.PAST /
 ✓ 'a-llooy-ca-na].
 3GEN-be.happy-IMPERF-REM.PAST]
 On Christmas night, Mary was happy that her kid had been happy on Christmas morning.

Such data indicates that recent past tense, like present tense, cannot receive a relative reading in relative complements.

These differences in the expression of simultaneous and relatively-recent readings stand out amid properties of the tense system which otherwise remain insensitive to the choice among relative and simplex embeddings. For instance, like in simplex embeddings, relative complements also allow a backshifted reading for past-under-past (modulo the case of recent past under remote past, discussed just above), i.e. one where the embedded clause predicate holds at a time before the attitude time:

- (43) *pro* hi-llooy-ca-qa [yoŋ ke *pro* ciq'aamqal weet'u
 3SG 3SUBJ-be.happy-IMPERF-REC.PAST [RP.NOM C 3SG dog NEG
 'a-wahoo-ca-qa].
 3POSS-howl-IMPERF-REC.PAST]
 She was happy her dog hadn't been howling.
- (44) Context: I lost my extra key for a long time and then one day I found it!
pro timiipni-se-ne [yoŋ ke *pro* 'e-'peewi-se-ne].
 1SG remember-IMPRF-REM.PAST [RP.NOM C 1SG 3OBJ-look.for-IMPRF-REM.PAST]
 I remembered I had been looking for it. (So I put it somewhere safe.)

In a parallel way, prospective aspect embedded under past tense remains interpreted as 'forward-shifted' (in the sense that the embedded clause predicate holds at a time after the attitude time):²⁰

- (45) Halŋpaawit-pa *pro* lilooy-ca-qa [yoŋ ke-x lɛpwey-pe *pro*
 Sunday-LOC 1SG be.happy-IMPERF-REC.PAST [RP.NOM C-1 Lapwai-to 1SG
 paay-no' piilepti-pe ka'aw-pa]
 come-PROSP four-LOC day-LOC]
 On Sunday I was happy that I would come to Lapwai Thursday.

This body of data could in principle be approached in either of two ways. A first way would appeal to a sequence of tense (SOT) rule, specific to relative complements, that either semantically deletes the embedded past tense (Ladusaw 1977, Ogiwara 1989 *et seq*; von Stechow 1995, 2003, Sharvit 2014, 2018) or allows an embedded morphological past tense to be licensed without contributing anteriority (Heim 1994, Stowell 1996, Kratzer 1998, Schlenker 1999, Kusumoto 2005, Grønn and von Stechow 2010, Klecha 2016), in either case in the context of a matching matrix

²⁰Note that no morphological tense marking is possible outside of prospective aspect on a future interpretation. The precise composition of TAM morphology in the case of prospective aspect requires further study.

past tense.²¹ A second way would appeal to the idea that tenses may be interpreted *de re*, much as ordinary pronouns and other referential expressions may be (Heim 1994, Abusch 1997, Ogihara and Sharvit 2012, Altshuler and Schwarzschild 2013, Sharvit 2014, 2018, Cable 2015, Bochnak et al. 2019, Tsilia 2021, Sharvit and Moss 2022, among others).

An attraction of this second type of view is that it makes for a clear connection between the behavior of tenses and of first person pronouns in relative vs. simplex embeddings, respecting the generalization alluded to above. We have seen that both relative tenses and shifty first person indexicals in simplex embeddings are dedicated *de se* phenomena. In relative embeddings, while first person pronouns are permitted, they must receive unshifted, *de re* readings. On the *de re* analysis, essentially the same pattern holds of embedded tenses. The overall generalization is thus:

(46) *Relative embedding generalization*

Tenses and indexical pronouns in relative embeddings cannot be read *de se*.

By contrast, on an SOT analysis, a *de se* semantics for embedded tense would remain in place across both types of complements; the semantics of embedded tense is simply obscured, in relative complements only, by LF deletion or uninterpreted morphological past tense.

Empirical support for the idea that relative complements feature obligatorily *de re* readings of tense, as opposed to an SOT rule, comes from complex embedding structures featuring future under past tense. In an SOT language, such as English, such structures allow embedded clauses describing (potential) future events or states to surface with past tense. This is the case for the bolded verb forms in (47).

- (47) a. John decided a week ago that in ten days at breakfast he would say to his mother that they **were** having their last meal together. (Abusch 1988, 1997)
- b. A week ago he said that in ten days he would buy a fish that **was** still alive. (von Stechow 1995, Ogihara 1996)

Because the most embedded clauses in these examples do not describe past events, their past marking must be attributed to an SOT rule, rather than to a *de re* reading of past tense (Abusch 1997; see discussion in Sharvit 2018). In a language which uses only *de re* mechanisms to derive simultaneous readings of past-under-past, we expect that clauses that describe only (potential) future eventualities should not be able to host past morphology. Ogihara and Sharvit (2012) and Sharvit (2018) show that this prediction is borne out for Hebrew. Examples (48) and (49) show that it is borne out in Nez Perce relative complements as well. Example (48), like Abusch’s “breakfast” example in (47a), features three levels of clausal embedding; the matrix clause bears a past tense, the medial clause a forward-shifting modal, and the most embedded clause describes a (possible) future state. Unlike in English, past tense cannot be used in the most embedded clause. Instead, present is used (as the most embedded clause receives a simultaneous reading with respect to the simplex attitude clause that immediately embeds it.)

²¹This is a simplification of the contextual specification for SOT. See von Stechow (1995) and Ogihara (1996, ch 4). For recent discussion of the need for SOT rules in natural language in general, see Altshuler and Schwarzschild (2013), Sharvit (2018) and Mucha, Renans, and Romoli (2023). On optional SOT, see Tsilia (2021).

- (48) Context: Tommy is a little kid who loves bouncy castles, the kind only little kids can jump on. Right now he's small enough for that, but he's afraid that he will grow and next year he will be too big.

Watiisx Tommy hi-tim'neenek-sa-qa [yo̥ ke naaqc taayam *pro*
 1.day.away Tommy 3SUBJ-worry-IMPERF-REC.PAST [RP.NOM C one summer 3PL
 hi-pa-a-no'qa, [tamawin himeeq'is 'ee ✓ wees / ✗ weeke]].
 3SUBJ-S.PL-say-MODAL [too big 2SG.CLITIC be.PRES / be.PAST]]
 Yesterday Tommy was worrying that next summer they would say that he was too big.

Example (49), modeled on the Ogihara/von Stechow “live fish” example in (47b), features a relative clause in a future (properly: prospective aspect) clause under a past tense matrix clause. Again, in English, the tense in the relative clause can be past even though the relative clause eventuality is located entirely in the (possible) future; this is not possible in Nez Perce. Instead, prospective aspect must be used. (Note that Nez Perce prospective aspect, unlike the English future, does not shift the evaluation time of present tense in relative clauses. See fn 15.)

- (49) *pro* hi-tmiipni-sa-qa [yo̥ ke watiisx *pro*
 3SG 3SUBJ-remember-IMPERF-REC.PAST [RP.NOM C 1.day.away 3SG
 hi-nee-sepex-nu' mamayas-na naaqc nacoo̥ [RelClause yo̥₃ ke t₃
 3SUBJ-O.PL-show-PROSP children-ACC one salmon [RP.NOM C
 ✓hi-wek-u' / ✗hi-weeke waaq'is]]
 3SUBJ-be-PROSP / 3SUBJ-be.PAST alive]]
 He remembered that tomorrow he would show the kids a fish that was (still) alive.

I conclude that Nez Perce is not an SOT language and that tense in relative complements must be read *de re*.

3.3 The intermediate status of locative indexical shift in relative embedding

We come now to the third and final difference between relative embedding and simplex embedding, which concerns locative indexical shift. We saw in (17) that locative indexical shift is not a dedicated *de se* phenomenon in Nez Perce. Accordingly, if the main restriction on relative embedding is simply that dedicated *de se* devices are unavailable, we might expect locative shift to remain possible in relative embedding. We have also seen, however, that locative shift in simplex embedding is only available in cases in which first person also shifts. Given that first person cannot shift in relative embedding, we might expect locative shift to be impossible in relative embedding. The fact is that locative shift has an intermediate status in relative embedding: speakers accept shifty readings of locative indexicals in relative complements about half the time.

- (50) % 'Inlawtiwaa hi-llooy-ca-∅ DC-pa [yo̥ ke Obama kine
 my.friend 3SUBJ-be.happy-IMPERF-PRES DC-in [RP.NOM C Obama here
 hi-tew'ye-ce-∅].
 3SUBJ-live-IMPERF-PRES]
 My friend in DC_i is happy that Obama lives here_i. [elicited in Idaho]

I will model this variation by assuming that speakers internally represent two grammars (Yang 2000, 2004), one of which allows locative shift in relative embedding and one of which does not.

4 Simplex embeddings as centered attitude reports

An account of the three differences just reviewed requires three parts: first, an account of the behavior of shift first person indexicals, relative tense, and shift locative indexicals in simplex embedding; second, an account of the Relative Embedding Generalization, (46); and third, an account for the mixed behavior of shift locative indexicals in relative embedding.

Let us begin with an overview of the relevant factors relating to indexical shift in simplex embedding, following previous work (Deal 2014, 2020). A first assumption—necessary on any approach to embedded tense or indexical shift, given the *de se* data reviewed in section 2—is that simplex embedding verbs feature centered quantification. Thus, to a first pass, the simplex embedding verb *neki* ‘think’ may be treated semantically exactly as in (1):

$$(51) \quad \llbracket neki \text{ ‘think’} \rrbracket^{c,i} = \lambda P_{\langle e \times i \times s, t \rangle} . \lambda e . \lambda x . \forall \langle y, t', w' \rangle \in DOX(x, \tau(e), w_i) : P(\langle y, t', w' \rangle) = 1$$

Where $\langle y, t', w' \rangle \in DOX(x, t, w)$ iff x believes in w at t that she might be y in w' at t' .
(v. 1)

This denotation is given relative to a context and an index (though it depends only on the latter). For present purposes, I assume that contexts and indices are tuples $\langle y, l, t, w \rangle$, where y is an individual, l a location, t a time, and w a world.²² No constraint is imposed that y speaks or otherwise holds an attitude at l at t in w (i.e. ‘improper contexts’ are allowed). The formally identical treatment of indices and contexts follows von Stechow (2003), von Stechow and Zimmermann (2005), and Anand (2006). I will represent tuples of this form as being of type κ .

Given this setup, the quantification expressed by the attitude verb is very similar to full quantification over indices (or, for that matter, contexts). The parallel becomes exact if we allow the *de se* perspective encoded by the attitude verb to extend to locations as well as individuals and times:

$$(52) \quad \llbracket neki \text{ ‘think’} \rrbracket^{c,i} = \lambda P_{\langle \kappa, t \rangle} . \lambda e . \lambda x . \forall \langle y, l, t', w' \rangle \in DOX(x, \tau(e), w_i) : P(\langle y, l, t', w' \rangle) = 1$$

Where $\langle y, l, t', w' \rangle \in DOX(x, t, w)$ iff x thinks in w at t that she might be y in w' at t' at l .
(v. 2)

An advantage of the proposal in (52) is that a very simple composition rule can be stated that allows the verb to compose with its clausal complement by means of abstraction over indices:²³

$$(53) \quad \text{Centered Intensional Function Application} \quad (\text{CIFA})$$

If α is a branching node and $\{\beta, \gamma\}$ the set of its daughters, then for any context c , index i , and assignment g : if $\llbracket \beta \rrbracket^{c,i,g}$ is a function whose domain contains $\lambda i' . \llbracket \gamma \rrbracket^{c,i',g}$, then $\llbracket \alpha \rrbracket^{c,i,g} = \llbracket \beta \rrbracket^{c,i,g}(\lambda i' . \llbracket \gamma \rrbracket^{c,i',g})$.

One consequence of this setup is that any individual or temporal value drawn from the index within the scope of the attitude verb will be a *de se* value.

²²As above, I ignore second person; see Deal (2020) for a fuller treatment.

²³This is a technical convenience. Since there are no known dedicated *de se* locative devices in Nez Perce, an alternative, equally empirically adequate possibility would involve adopting the verb semantics in (51) and modifying the composition rule to ignore locatives. And of course it is equally possible, given either (51) or (52), to handle abstraction via syntactically represented λ operators.

To capture indexical shift, I begin with the standard Kaplanian assumption that indexicals express functions on context:

- (54) For any index or context $\langle y, l, t, w \rangle$, let $auth_{\langle y, l, t, w \rangle} = y$ and $loc_{\langle y, l, t, w \rangle} = l$
- a. $\llbracket 1SG \rrbracket^{c,i} = auth_c$
 - b. $\llbracket kine \text{ 'here' } \rrbracket^{c,i} = loc_c$

To handle shiftiness, I assume (following the argumentation in Deal 2014, 2020) that the Nez Perce lexicon contains two shift operators, i.e. operators that modify the context of interpretation relative to which their complement is interpreted (Anand and Nevins 2004). A semantics for the two operators is given syncategorematically in (55).^{24 25}

- (55) a. $\llbracket OP_{auth} \alpha \rrbracket^{c,i} = \llbracket \alpha \rrbracket^{c^{auth_i/auth},i}$
b. $\llbracket OP_{LOC} \alpha \rrbracket^{c,i} = \lambda e. \llbracket \alpha \rrbracket^{c^{LOC(e)/loc},i}(e)$

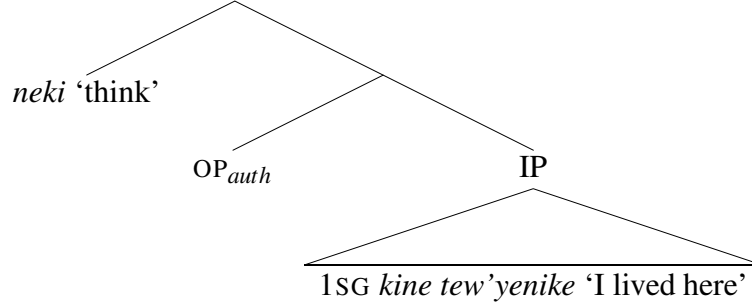
Both of these operators effect a contextual modification by overwriting a contextual coordinate. However, the details of this overwriting differ in two ways. First, the two operators modify separate coordinates of a contextual tuple $\langle y, l, t, w \rangle$: OP_{auth} modifies the individual coordinate, which is referenced by first person indexicals, and OP_{LOC} modifies the location coordinate, which is referenced by locative indexicals. Second, the information used for overwriting comes from separate sources for the two operators. For OP_{auth} , contextual information is overwritten with information from the index (as originally proposed by Anand and Nevins 2004 and Anand 2006). Syntactically, this operator attaches in the left periphery of a complement clause. It is therefore in the scope of the attitude verb, which expresses *de se* quantification over index values. In informal terms, the role of the operator is to transfer one of these *de se* values—the value which concerns individuals the attitude holder takes themselves to be—into the contextual tuple, with the result that any first person indexical in the scope of the operator ends up semantically bound by the *de se* quantification expressed by the attitude verb. This is shown for the composition of structure (56a), a small modification on (19) above.²⁶

²⁴Notation for context modification here is straightforwardly carried over from standard applications: Let $c^{Val/Coord}$ be that context c' that is like exactly like c with the possible exception of the fact that $Coord_{c'} \neq Coord_c$ (where $Coord$ represents some coordinate of contexts); and furthermore $Coord_{c'} = Val$. For a categorematic treatment of shift operators, see Deal (2020).

²⁵Deal 2014, 2020 in fact argues that Nez Perce uses an OP_{pers} operator that affects both author and addressee parameters of context. I simplify this proposal here, in keeping with the focus on first rather than second person.

²⁶The modification is simply that this example uses ‘think’ whereas (19) used ‘say’. Accounting for the original example is uncomplicated and omitted here only for reasons of space. In this example I also ignore details related to the complement clause predicate, such as embedded tense, as well as complications related to *de re* readings, in this case for the embedded unshifted locative expression. On *de re* semantics, see section 6.

(56) a.

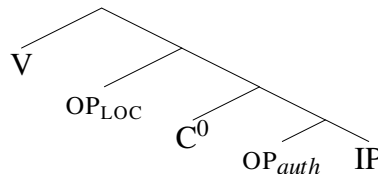


- b. $\llbracket (56a) \rrbracket^{c,i} = \llbracket neki \rrbracket^{c,i} (\lambda i'. \llbracket OP_{auth} 1SG kine tew'yenike \rrbracket^{c,i'})$ (by CIFA)
- c. $= \lambda e. \lambda x. \forall \langle y, l, t', w' \rangle \in DOX(x, \tau(e), w_i) : \llbracket OP_{auth} 1SG kine tew'yenike \rrbracket^{c, \langle y, l, t', w' \rangle}$
 Where $\langle y, l, t', w' \rangle \in DOX(x, t, w)$ iff x thinks in w at t that she might be y in w' at t' at l . (by lexical entry *neki*)
- d. $= \lambda e. \lambda x. \forall \langle y, l, t', w' \rangle \in DOX(x, \tau(e), w_i) : \llbracket 1SG kine tew'yenike \rrbracket^{c^{y/auth}, \langle y, l, t', w' \rangle}$
 (by lexical entry OP_{auth})
- e. $= \lambda e. \lambda x. \forall \langle y, l, t', w' \rangle \in DOX(x, \tau(e), w_i) : y$ lived at loc_c in w'
 (by FA, remaining lexical entries)

This semantics delivers the *de se* restriction on shifty first person by using a value from the index to overwrite the context. For Nez Perce shifty locative indexicals, as we saw, there is no parallel restriction. Accordingly, OP_{LOC} effects a contextual change in a different way: it overwrites contextual information with location information drawn from the attitude predicate's event argument. Assuming that this argument is introduced by the attitude verb itself, OP_{LOC} must syntactically attach above the predicate for composition reasons.²⁷ In that high position, its complement provides a property of events, as required. Before turning to an example, let us recall the relationship among locative shift and person shift discussed above in connection with (19) and (20). As we saw there, in simplex embedding, locative indexicals may shift only if their clausemate person indexicals shift as well. Deal (2014, 2020) proposes to account for this restriction syntactically, by reference to the notion of a functional sequence (Zamparelli 1995, Rizzi 1997, Cinque 1999, i.a.). The core idea is that OP_{LOC} attaches higher than OP_{auth} when both are present; the two form a sequence of

²⁷ This is a simplification of the proposal in Deal (2020). That work adopts a proposal from Anand and Hacquard (2008a) (closely related to proposals by Kratzer 2006 and Moulton 2015), according to which modal quantification is contributed compositionally by the finite C^0 (not the attitude verb itself). The finite C^0 also introduces an event argument; the role of lexical attitude verbs is to modify this event argument with information specific to the particular type of attitude (e.g. thinking, speaking). In this system, the two attachment sites of shifty operators are above and below C^0 , not the lexical verb; all attachment sites for shifty operators are within the verb's complement clause, as in (i). As in the simplified version presented here, OP_{LOC} attaches outside the scope of centered modal quantification (above C^0) and OP_{auth} attaches inside it (below C^0).

(i)



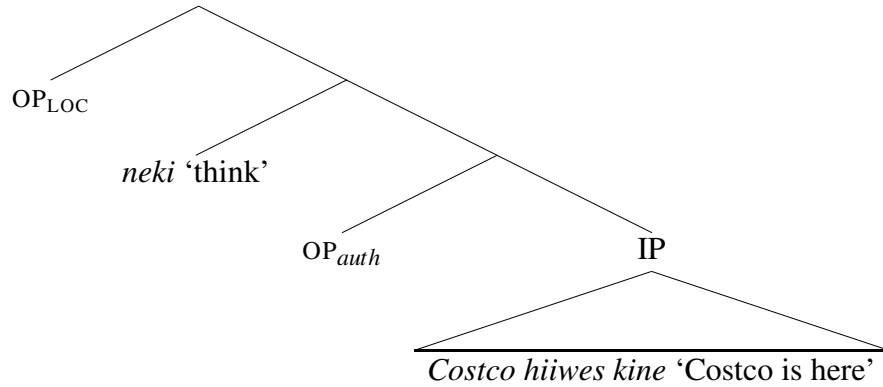
operators $OP_{LOC} > OP_{auth}$. This sequence may be fully instantiated in a syntactic structure, meaning both operators are present; it may be fully absent, meaning no operators are present; or it may be partially instantiated. When a functional sequence is partially instantiated, elements higher in the sequence may be present only if those lower in the sequence are present as well. Thus the presence of OP_{LOC} syntactically requires the presence of OP_{auth} . Looking at data from a range of languages, Deal (2020) extends this proposal beyond person and locative indexicals, and argues that it yields superior empirical coverage compared to a purely semantic alternative—e.g. one that accounts for the relation between person shift and locative shift by giving locatives meanings comparable to *the location of* $auth_c$ (e.g. as in Harbour 2016; see also Deal To appear). Here, we will see an additional reason to prefer the syntactic account when we turn to the behavior of locative indexicals in relative embedding (where, recall, person shift is impossible, but locative shift is sometimes possible—directly in contrast to the pattern in simplex embedding).

A consequence of this proposal is that an example like (17), repeated in part below, must be analyzed as involving both a locative shifter and an author shifter—though the latter will be vacuous here, given that no first person element is present in the embedded clause.

- (57) (In Nez Perce: the woman is in Clarkston_i, but she thinks she's in Asotin, and ...)

pro hi-neki-se- \emptyset [Costco hii-wes kine].
 3SG 3SUBJ-think-IMPERF-PRES [Costco 3SUBJ-be.PRES here]
 She thinks Costco is here_i.

- (58) a.



- b. $\llbracket (58a) \rrbracket^{c,i} = \lambda e. \llbracket neki \ OP_{auth} \ Costco \ hiiwes \ kine \rrbracket^{c^{LOC(e)/loc},i}(e)$ (by lexical entry OP_{LOC})
 c. $= \lambda e. [\lambda e'. \lambda x. \forall \langle y, l, t', w' \rangle \in DOX(x, \tau(e'), w_i) : \llbracket OP_{auth} \ Costco \ hiiwes \ kine \rrbracket^{c^{LOC(e)/loc}, \langle y, l, t', w' \rangle}(e)](e)$ (by lexical entry *neki*, CIFA)
 d. $= \lambda e. \lambda x. \forall \langle y, l, t', w' \rangle \in DOX(x, \tau(e), w_i) : \llbracket OP_{auth} \ Costco \ hiiwes \ kine \rrbracket^{c^{LOC(e)/loc}, \langle y, l, t', w' \rangle}(e)$ (β -reduction)
 e. $= \lambda e. \lambda x. \forall \langle y, l, t', w' \rangle \in DOX(x, \tau(e), w_i) : \llbracket Costco \ hiiwes \ kine \rrbracket^{c^{y/auth, LOC(e)/loc}, \langle y, l, t', w' \rangle}(e)$ (by lexical entry OP_{auth})
 f. $= \lambda e. \lambda x. \forall \langle y, l, t', w' \rangle \in DOX(x, \tau(e), w_i) : Costco \text{ is at } LOC(e) \text{ in } w'$ (by FA, remaining lexical entries)

This system delivers the desired result that the locative indexical has a shifted value but that this value is not subject to a *de se* requirement.

Let us now briefly review the ways that this system captures the six generalizations about indexical shift reviewed in section 2.2. First, it captures both shift of first person pronouns (regardless of their morphosyntactic form) and shift of locative indexicals, by allowing both the author and location coordinates of the context to be shifted by shifty operators. Second, it does so in a way that respects the syntactic permeability of clauses that host indexical shift; one would not expect shifty operators (unlike true quotation operators) to interfere with A' movement. Third, the Shift Together effect is captured in virtue of the fact that the account involves overwriting of contextual parameters. If an OP_{auth} is present on a clause edge, all first person pronouns in the clause must shift; there is no optionality on a pronoun-by-pronoun basis. Fourth, it captures the *de se* requirement on shifty first person but not on shifty locative, as discussed in the preceding paragraphs. Fifth, it captures the optionality of shift by reference to syntactic optionality of shifty operators, and it captures the relationship between first person shift and locative shift by reference to the functional sequence the operators form. And sixth, it captures the fact that shift is possible for all simplex embedding verbs by reference to the idea that shifty operators are part of the functional sequence characteristic of a certain class of complement clauses—one shared across all the simplex embedding verbs, if not all attitude verbs in the language (a question we return to below).

Turning now to embedded tense, I follow a broad consensus in the literature in positing direct binding of an embedded temporal pronoun by the attitude verb (Heim 1994, von Stechow 1995, Ogihara 1996, Abusch 1997, among many others).²⁸ It should be pointed out that the overall semantics of *de se* shifty operator constructions amounts to binding of an indexical by the attitude verb, albeit in an indirect way: the attitude verb quantifies over indices, the shifty operator copies indices into contexts, and the indexical references contexts. Binding analyses dispense with the intermediate step and have tense meanings make reference to index values directly. For simplicity, I adopt a simple referential semantics for tenses, in which this index-sensitivity is foregrounded.²⁹

- (59) a. $\llbracket PRES_n \rrbracket^{c,i,g} = g(n)$, if $g(n) = t_i$. Undefined otherwise.
 b. $\llbracket REC.PAST_n \rrbracket^{c,i,g} = g(n)$, if $g(n)$ is shortly before t_i . Undefined otherwise.

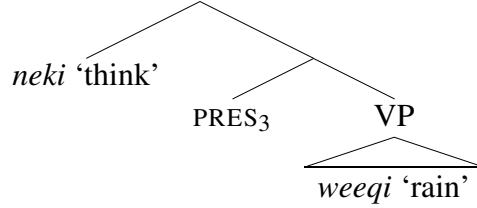
This semantics is exemplified in (60)-(61), where embedded present tense is used to express a *de se* simultaneous reading. (I continue to abstract away from details of the embedded clause.)

²⁸That is to say, I set aside (for reasons of space) the possibility that relative tense behavior is itself a form of indexical shift (Schlenker 1999), involving a shifty temporal operator that effects a *de se* shifty semantics. Such a view would require that a temporal shifty operator be obligatory in the complements of simplex embedding verbs in Nez Perce and therefore that the shifty temporal operator be lowest in the functional sequence of operators, $OP_{LOC} > OP_{auth} > OP_{time}$. While I will not pursue this type of analysis here, it turns out that this proposal corresponds perfectly to Deal's (2020) conclusions regarding the syntax and semantics of temporal indexical shifters, reached on the basis of shift of temporal indexical adverbs in various languages.

²⁹A similar formalism can be found in Cable 2013, 2015, 2017. The main ideas here follow Abusch 1997: tense is referential and relates to 'local evaluation time'. For some recent discussion of referential vs. quantificational tense theories, see Ogihara and Sharvit 2012, Sharvit 2014, Mucha 2015, and Chen et al. 2021. While space reasons rule out a full exposition here, suffice it to say that I believe that a quantificational semantics can also be made fully compatible with the Nez Perce data. I assume that composition of temporal variables with VPs is mediated by viewpoint aspect (Kratzer 1998).

- (60) Meeli hi-nek-sa-qa [*pro* hi-weeqi-se- \emptyset].
 Mary 3SUBJ-think-IMPERF-REC.PAST [3SG 3SUBJ-rain-APPL-IMPERF-PRES]
 Mary believed it was raining.

(61) a.



- b. $\llbracket (61a) \rrbracket^{c,i,g} = \llbracket neki \rrbracket^{c,i,g}(\lambda i'. \llbracket PRES_3 weeqi \rrbracket^{c,i',g})$ (by CIFA)
 c. $= \lambda e. \lambda x. \forall \langle y, l, t', w' \rangle \in DOX(x, \tau(e), w_i) : \llbracket PRES_3 weeqi \rrbracket^{c, \langle y, l, t', w' \rangle, g}$
 (by lexical entry *neki*)
 d. $= \lambda e. \lambda x. \forall \langle y, l, t', w' \rangle \in DOX(x, \tau(e), w_i) : \text{it rains at } t' \text{ in } w'$
 (by FA, remaining lexical entries)

This demonstrates the desired result: the embedded present tense picks out the time at which the attitude holder self-locates.

5 Relative embeddings as uncentered attitude reports

We now have the first of our three desiderata: an account of shifty indexicals and relative tense in simplex embeddings. We are thus in a position to ask: Why should relative embeddings be different? Why is it that the dedicated *de se* devices available in simplex embedding should be unavailable in relative embedding? Why should the tenses and pronouns that do occur in relative embeddings resist interpretation *de se* (the Relative Embedding Generalization)?

(62) *Relative Embedding Generalization*

Tenses and indexical pronouns in relative embeddings cannot be read *de se*.

I aim to show that the restriction in (62) is accounted for most straightforwardly via a theory that departs from Uniformity: *de se* readings are impossible in relative embeddings simply because relative embedding complements do not denote sets of centered worlds. Relative embedding reports are uncentered attitude reports.

We saw in (3) and (4) above how this type of proposal might be implemented for simple doxastic verbs like ‘believe’. Relative embedding verbs like *lilooy* ‘be happy’, of course, have a slightly richer semantics. The proposal to be given in (63) for *lilooy* ‘be happy’ follows Heim’s (1992) analysis of English *be glad* (which is also an uncentered analysis). As Heim puts it, “*John is glad you are gone* means ‘John thinks that because you are gone he is in a more desirable world than he would be in if you were not gone’” (p 205). Two central ideas of this analysis are (i) ranking of worlds in terms of desirability and (ii) counterfactual conditionality. In (63), while I follow Heim’s treatment of (i), I have simplified matters related to (ii), due to their considerable complexity. As above, I have added an event argument. I also temporarily set aside questions about factivity. Observe that (63a) is a variant of (3) above, where DOX^h is a Hintikka-style doxastic alternativeness relation that returns a set of worlds; (63b) is a variant of (4), where the doxastic alternativeness relation returns a set of individual-world-time tuples, but individual and time coordinates are subsequently ignored.

(63) An uncentered semantics for *lilooy* ‘be happy’:

- a. $v1: \llbracket lilooy \rrbracket^{c,i} = \lambda p_{\langle s,t \rangle}. \lambda e. \lambda x. \forall w' \in DOX^h(x, \tau(e), w_i) : p(w') = 1 \wedge w' \text{ is more desirable to } x \text{ at } \tau(e) \text{ in } w_i \text{ than is any of the nearest } \neg p \text{ worlds}$
- b. $v2: \llbracket lilooy \rrbracket^{c,i} = \lambda p_{\langle s,t \rangle}. \lambda e. \lambda x. \forall \langle y, t', w' \rangle \in DOX(x, \tau(e), w_i) : p(w') = 1 \wedge w' \text{ is more desirable to } x \text{ at } \tau(e) \text{ in } w_i \text{ than is any of the nearest } \neg p \text{ worlds}$

Both analyses depart from Uniformity, since on either analysis the complement clause provides only a set of worlds, not a set of centered tuples. (Accordingly, the composition of such predicates with their complements proceeds via standard Intensional Function Application (IFA, Heim and Kratzer 1998) rather than via the centered version shown in (53) above.) We return to the choice between these analyses in discussing *de re* readings in section 6.

What do we expect for pronouns and tenses in the complement of a verb like (63)? Let us consider tenses first. A tense is sensitive to local evaluation time. Given (63), *lilooy* ‘be happy’ does not manipulate local evaluation time. Accordingly, a present tense in the complement of this verb is not expected to pick out the “internal now” of the attitude report, unlike in simplex embedding ((60), (61)). Suppose we are interested in a *lilooy* clause that is not further embedded. Our semantics for tense, (59), does not shift evaluation time; neither does *lilooy*. The present tense will thus have to pick out our starting evaluation time. This, I assume, is equivalent to the time of utterance, t_c , adopting a definition of truth at a context (and assignment) that follows Kaplan’s (1989, p 547):

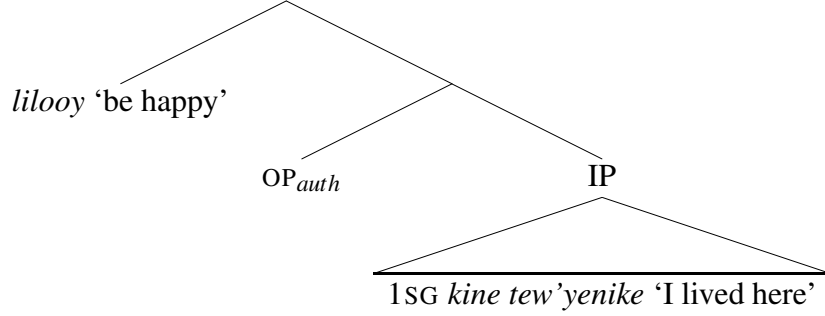
(64) A sentence α is true at a context c and assignment g iff $\llbracket \alpha \rrbracket^{c,c,g} = 1$

This leads to a consequence concerning what von Stechow (1995) calls *Abusch’s Constraint*: “in complements of attitudes, we can never have a “referential” tense, i.e., an absolute or anaphorical tense” (p. 1). von Stechow makes two key remarks about this proposal. First, ideally, a way to derive this constraint would be by appeal to a broader principle that rules out direct reference in attitude complements for all kinds of expressions, not just tenses (*ibid* 20). Second, a way to avoid violation of the constraint is to impose a *de re* reading; this is generally what occurs whenever we are concerned with how referents established in one world are represented in another. Tenses in relative complements should, accordingly, have to be read *de re*. This matches our conclusions regarding the interpretation of tense in relative complements in section 3.2. A number of distinct proposals have been offered as to how the *de re* reading of embedded tenses arises (as is true for *de re* readings generally), some but not all of which are compatible with the uncentered semantics in (63). The issues involved here are meaty. We take them up in section 6. In the remainder of this section, we lay the groundwork for that discussion by noting where a *de re* semantics will be required.

Turning now to first persons, one consequence of the uncentered semantics in (63) is that no special syntactic ban on the shifty operator OP_{auth} needs to be put in place: OP_{auth} could be present, or absent, with no effect on the interpretation of embedded pronouns. Given that the ingredients to *de se* readings (viz centering) are absent, the embedded indexical will need to be read *de re* in either case (by the generalized version of Abusch’s constraint). To see this, consider a variant on (56) with relative embedding verb *lilooy* ‘be happy’ instead of simplex embedding verb *neki* ‘think’. As line (c) shows, the effect of OP_{auth} is to overwrite the context’s author coordinate with the corresponding coordinate of the index. Since this structure features no modification of this index coordinate whatsoever, and the starting value for the index is the same as the context, by

(64), this has the effect of overwriting a value with itself. This captures the desired result for relative embedding: the embedded indexical does not shift, *even if* OP_{auth} is present.³⁰

(65) a.



- b. $\llbracket (65a) \rrbracket^{c,i} = \lambda e. \lambda x. \forall w' \in DOX^h(x, \tau(e), w_i) : \llbracket OP_{auth} \text{ 1SG kine tew'yenike} \rrbracket^{c,i^{w'/w}} \wedge w' \text{ is more desirable to } x \text{ at } \tau(e) \text{ in } w_i \text{ than is any of the nearest } \neg \llbracket OP_{auth} \text{ 1SG kine tew'yenike} \rrbracket^{c,i^{w'/w}} \text{ worlds}$ (by lexical entry *lilooy* and IFA)
- c. $\llbracket OP_{auth} \text{ 1SG kine tew'yenike} \rrbracket^{c,i^{w'/w}} = \llbracket \text{1SG kine tew'yenike} \rrbracket^{c,auth_i/auth,i^{w'/w}} = \text{auth}_c \text{ lived at } loc_c \text{ in } w'$ (by lexical entry OP_{auth} and (64))
- d. Where underlined elements are to be read *de re*:
 $\llbracket (65a) \rrbracket^{c,i} = \lambda e. \lambda x. \forall w' \in DOX^h(x, \tau(e), w_i) : \underline{\text{auth}_c} \text{ lived at } \underline{loc_c} \text{ in } w' \wedge w' \text{ is more desirable to } x \text{ at } \tau(e) \text{ in } w_i \text{ than is any of the nearest worlds in which } \underline{\text{auth}_c} \text{ did not live at } \underline{loc_c}.$ (by lines b and c)

Setting aside the precise details of *de re* semantics, the semantics in (65d) predicts that simple affirmative sentences containing the VP in (65a) will be true just in case the attitude holder believes that the speaker ($auth_c$) lived at the utterance location (loc_c) and considers that state of affairs preferable to one in which the speaker did not live at the utterance location. The reader can verify that exactly the same semantics will obtain in a case where OP_{auth} is absent. Now, one might wonder whether this state of affairs could, after all, give rise to a situation in which OP_{auth} is banned from relative complements—not as a *sui generis* syntactic restriction, but in virtue of some principle like (66):

(66) No Vacuous Operators!

Where $[OP \alpha]$ is semantically equivalent to $[\alpha], * [OP \alpha]$.

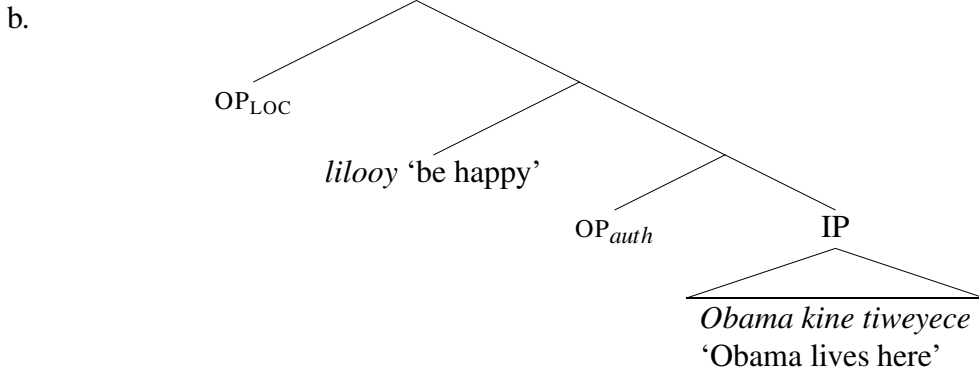
We return to this idea just below.

Our final desideratum is an account for the intermediate status of locative shifting in relative embedding. As we have seen, locative indexical shift presents an immediate difference from first person shift and embedded tense: shifty locative indexicals need not be read *de se*. In section 4, this fact was captured with the help of a locative shifty operator that overwrites the contextual location value with the attitude location, *de re*. Could such an operator attach in a relative complement?

³⁰The discussion here illustrates in particular that the indexical does not receive a shifty reading even if it remains *in situ* in an embedded clause that contains a shifty operator. As discussed in section 6, however, it may be that elements read *de re* systematically move out of the embedded clause (*res* movement). If this is so, it remains true that the presence vs. absence of the shifty operator has no effect on whether or not the indexical shifts.

The semantics certainly presents no obstacle: states of being happy, for instance, have locations just as events of thinking do. In terms of the syntax, we have assumed throughout that the presence of OP_{LOC} requires the presence of OP_{auth} . Accordingly, so long as OP_{auth} is possible—that is, no principle like (66) is in place—then OP_{LOC} should be syntactically possible as well. For the grammar which allows a shifty locative reading in (50), repeated below in (67a), we therefore posit a partial LF as in (67b), yielding the semantics in (67c):

- (67) a. % 'Inlawtiwaa hi-lloy-ca- \emptyset DC-pa [yo \hat{x} ke Obama kine
 my.friend 3SUBJ-be.happy-IMPERF-PRES DC-in [RP.NOM C Obama here
 hi-tew'ye-ce- \emptyset]
 3SUBJ-live-IMPERF-PRES]
 My friend in DC_i is happy that Obama lives here.[elicited in Idaho]



- c. Where underlined elements are to be read *de re*:
 $\llbracket (67b) \rrbracket^{c,i} = \lambda e. \lambda x. \forall w' \in DOX^h(x, \tau(e), w_i) : \underline{\text{Obama}} \text{ lives at } \underline{LOC(e)} \text{ in } w' \wedge w' \text{ is more desirable to } x \text{ at } \tau(e) \text{ in } w_i \text{ than is any of the nearest worlds in which } \underline{\text{Obama}} \text{ does not live at } \underline{LOC(e)}.$

We derive the desired result for (67a): my friend, located in DC, believes Obama lives at his location, and prefers that state of affairs to one in which Obama lives elsewhere.

It remains to explain the grammar that rules out (67a), allowing only unshifty readings for locative indexicals. Note that this grammar is one that entirely forbids indexical shift in relative embeddings. For person indexicals, as we saw, shift may be ruled out without any ban on the shifty operator OP_{auth} . Things are different for locative indexicals, as (67) shows: if the shifty operator is present, then locative indexicals do indeed shift. Ruling out locative indexical shift requires ruling out the shifty operator. I would like to suggest that the reason for such a restriction traces back to a potential ban on vacuous operators, (66). Suppose that the two grammars of Nez Perce are distinguished by whether or not they adopt (66). The grammar that does not adopt it will allow the vacuous OP_{auth} operator in (67) and therefore allow OP_{LOC} to be projected. But the grammar that does adopt (66) will not allow OP_{auth} to be projected at all in relative complements. Given that the syntactic presence of OP_{LOC} depends on the presence of OP_{auth} , this means that OP_{LOC} will not be possible. The result is that all indexical shift, both person and locative, will be ruled out in this second type of grammar.

A closing comment on the uncentered analysis of relative complements concerns their morphology. On this analysis, there is a certain abstract similarity between relative complements and true relative clauses: both express simplex properties, albeit of different sorts of objects (worlds

vs. individuals). This contrasts with simplex complement clauses, which express more complex properties—or alternatively, properties of more complex model-theoretic objects. A potential generalization, to be subject to crosslinguistic investigation, is that full abstraction over centered propositions is always grammatically unmarked, handled by a semantic rule (viz CIFA), whereas “incomplete” abstract—just over individuals, or just over worlds, or just over times—must be grammatically marked in some way, derived by syntactically-represented means. In a related vein, one might further speculate that the similarity of marking between relative clauses and relative complements in Nez Perce arises because both feature an operator moving to the clause edge, creating a simplex abstraction. In the case of relative clauses, this operator leaves a type *e* trace, and abstracts over individuals; in the case of relative complements, it leaves a type *s* trace, and abstracts over worlds. Caponigro and Polinsky (2011) explore this type of analysis for relative embedding in Adyghe. Confirmation of this style of analysis would furnish a new type of argument for a representation of world arguments in the syntax.

6 Uncentered attitude reports and theories of *de re*

A conclusion now reached on grounds both empirical (see 3.2) and theoretical (von Stechow 1995) is that tenses and indexicals in relative complements must be read *de re* (a behavior also shared by other directly referential expressions, presumably). The goal of this section is to understand how this is. The literature on *de re* readings has offered a variety of compositional perspectives (Cresswell and von Stechow 1982, Heim 1994, Kratzer 1998, Aloni 2005, Percus and Sauerland 2003, Maier 2009, Keshet 2010, Schwager 2011, Ninan 2012, Sauerland 2014, Bar-Lev 2015, Deal 2018a, Percus 2021, Blumberg and Lederman 2021, Kratzer 2022, Tancredi and Sharvit 2022, Mayr and Schmitt 2023, among others). I review three prominent candidates: the *res*-movement theory, the concept generator theory, and the revisionist theory. As we will see, the concept generator theory proves incompatible with the uncentered semantics adopted in the previous section, in contrast to the *res*-movement and revisionist theories. Insofar as the arguments for uncentering are successful, then, they furnish a new argument against the concept generator theory as a generalized theory of *de re*. At the conclusion of this section, I will tentatively suggest that the best theory may be one that incorporates both *res*-movement and revisionism.

6.1 *Res-movement*

Res-movement involves syntactic displacement of the element(s) to be read *de re* (the *res*); this movement targets an argument position of the matrix verb, (68). The idea that *de re* readings are produced via *res* movement is commonly adopted in the tense literature (e.g. Heim 1994, Abusch 1997, Kratzer 1998, Ogihara and Sharvit 2012, Ogihara 1999, Altshuler and Schwarzschild 2013, Cable 2015, Bochnak et al. 2019).

$$(68) \quad [VP \quad [V_{de\ re} \quad \alpha_{res}] \quad [CP \ 1 \ \dots t_1 \ \dots]]$$


A sample denotation for a *res*-movement verb is given in (69), based on Heim (1994, 155).³¹

³¹Note that Heim’s formulation requires *f* to be provided by context, on pain of undefinedness. Here I simplify and invoke existential quantification over *f*.

$$(69) \quad \llbracket think_{de\ re} \rrbracket^{c,i,g} = \lambda \alpha_{\sigma}. \lambda R_{\langle \kappa, \langle \sigma, t \rangle \rangle}. \lambda e. \lambda x. \exists f [f(x, \tau(e), w_i) = \alpha \wedge acquaintance\text{-}based(f) \wedge \forall \langle y, l, t', w' \rangle \in DOX(x, \tau(e), w_i) : R(\langle y, l, t', w' \rangle)(f(y, t', w')) = 1]$$

This is a Uniformity-obeying verb denotation, such as might be adopted for a pronoun read *de re* under simplex embedding:

$$(70) \quad \begin{array}{l} \text{'Aayat hi-neki-se-}\emptyset \quad \quad \quad [pro \text{ hi-k'oomay-ca-}\emptyset \quad \quad \quad] \\ \text{woman 3SUBJ-think-IMPERF-PRES [3SG 3SUBJ-be.sick-IMPERF-PRES]} \\ \text{The woman}_i \text{ thinks she}_i \text{ is sick.} \end{array}$$

As a prologue to the extension of the *res*-movement theory to uncentered attitudes, let us walk through how the *res*-movement theory would handle this (centered) case. In this example the *res* is a 3rd person pronoun, to be interpreted as usual with the help of a variable assignment. Assigning an arbitrary index to this pronoun, the VP LF of this example is as shown in (71). Note that the interpretation of movement is non-standard: the trace left by movement of the pronoun is bound by a binder index at the edge of the embedded clause, rather than immediately subjacent to the landing site of movement. The truth-conditions computed for (70), assuming existential closure of the event variable and ignoring matrix tense, are provided in (72).

$$(71) \quad [VP \quad [think_{de\ re} \quad pro_1] \quad [CP \quad 2 \quad t_2 \text{ is sick}]]$$

\uparrow

$$(72) \quad \llbracket (70) \rrbracket^{c,i,g} = 1 \text{ iff } \exists e. \exists f. [f(\iota x[woman(x)], \tau(e), w_i) = g(1) \wedge acquaintance\text{-}based(f) \wedge \forall \langle y, l, t', w' \rangle \in DOX(\iota x[woman(x)], \tau(e), w_i) : f(y, t', w') \text{ is sick in } w' \text{ at } t']$$

On this analysis, the relationship between $g(1)$ (the referent of the pronoun read *de re*) and the attitude content is mediated by a function f . In the broader tradition of the Kaplan-Lewis theory of attitudes *de re* (Kaplan 1968, Lewis 1979), this function is understood as providing a description or ‘vivid name’ which locates the *res* in the evaluation world (and potentially a variety of different individuals in the doxastic alternatives of the attitude holder) based on how an individual (e.g. the attitude holder) is acquainted with that *res*. (This is why there is a requirement in (72) that f be acquaintance-based.) Suppose for instance that the attitude holder in (70)—let us call her Anna X.—sees herself on TV in the evaluation world, thinking ‘That woman is sick.’ (The sentence is felicitous in this context, as we saw in (39).) A possible value of f that witnesses the quantification in (72) is f_1 :

$$(73) \quad f_1 = \lambda \langle x, t, w \rangle. \iota z[x \text{ sees } z \text{ on TV at } t \text{ in } w]$$

Let the assignment be such that $g(1)$ is Anna X. Given that f_1 is acquaintance-based, the sentence is then true in virtue of it being the case that the one who Anna X saw on TV at attitude time in the evaluation world is Anna X herself, and that in all of Anna X’s centered doxastic alternatives $\langle y, l, t', w' \rangle$, that individual z who was seen on TV by y at t' in w' is sick at t' in w' .

Centered quantification played two (separable) roles in this analysis. The first role was a crucial one: centered values are used in calculating the output of f in the scope of the attitudinal quantification. Intuitively, this corresponds to the idea that f provides an acquaintance-based description which is evaluated under two sets of terms. The first are those of the matrix clause, where we are concerned with who Anna X actually did see on TV at t_1, w_1 . The second are those that reflect the attitude holder’s perspective: we are interested in individuals who, in each of Anna’s centered doxastic alternatives $\langle y, l, t', w' \rangle$, are that individual z who was seen by y —that is, the individual

center reflecting Anna’s *de se* perspective. Thus we are concerned with who Anna is actually acquainted with, and also with who her *de se* counterparts are acquainted with, by f_1 . It would not do to limit our concern strictly to Anna herself, leaving all *de se* counterparts aside, because this would have to mean invoking, relative to each doxastic alternative world, that individual z who was seen by Anna. This violates the generalized version of Abusch’s Constraint, as we would need to directly refer to Anna in an intensional environment.³² What we do instead is find the individual of whom Anna would say, “I see that person.” The first person nature of the paraphrase highlights the crucial way that *de re* builds on the ingredients of *de se*, on this theory. Centering is crucial because it provides the coordinates of perspective that are used to find the various referents for a perspectivalized, acquaintance-based description. A consequence is that a *res*-movement analysis for relative embedding complements cannot be built from the proposed denotation for a relative embedding verb that is entirely Hintikka-style, which we saw above in (63a):

- (74) Uncentered semantics v1: (from (63a))

$$\llbracket \text{lilooy ‘be happy’} \rrbracket^{c,i} = \lambda p_{\langle s,t \rangle} . \lambda e . \lambda x . \forall w' \in DOX^h(x, \tau(e), w_i) : p(w') = 1 \wedge w' \text{ is more desirable to } x \text{ at } \tau(e) \text{ in } w_i \text{ than is any of the nearest } \neg p \text{ worlds}$$

A *res*-movement analysis is incompatible with a treatment of attitude reports that entirely lacks centered quantification.

The second role for centered quantification in (69) proves more easily dispensed with. The complement clause has been treated as type $\langle \kappa, \langle \sigma, t \rangle \rangle$: it is a centered complement with an additional σ -type abstraction generated by α ’s movement. Could this clause have been treated, instead, as an *uncentered* complement—an ordinary $\langle s, t \rangle$ proposition—with an additional σ -abstraction? This move, together with the conclusion just reached regarding the need for centered quantification in the attitude verb itself, points to a *res*-movement semantics built from our second type of potential uncentered denotation, repeated below in (75) from (63b). A *res*-movement version of this proposal based on (69) is given in (76).

- (75) Uncentered semantics v2: (from (63b))

$$\llbracket \text{lilooy ‘be happy’} \rrbracket^{c,i} = \lambda p_{\langle s,t \rangle} . \lambda e . \lambda x . \forall \langle y, t', w' \rangle \in DOX^h(x, \tau(e), w_i) : p(w') = 1 \wedge w' \text{ is more desirable to } x \text{ at } \tau(e) \text{ in } w_i \text{ than is any of the nearest } \neg p \text{ worlds}$$
- (76) Uncentered *lilooy* ‘be happy’ with *res*-movement:

$$\llbracket \text{lilooy}_{de\ re} \rrbracket^{c,i,g} = \lambda \alpha_{\sigma} . \lambda R_{\langle s, \langle \sigma, t \rangle \rangle} . \lambda e . \lambda x . \exists f [f(x, \tau(e), w_i) = \alpha \wedge \text{acquaintance-based}(f) \wedge \forall \langle y, t', w' \rangle \in DOX(x, \tau(e), w_i) : R(w')(f(y, t', w')) = 1 \wedge w' \text{ is more desirable to } x \text{ at } \tau(e) \text{ in } w_i \text{ than is any of the nearest } w'' \text{ s.t. } R(w'')(f(y, t', w'')) = 0]$$

Given that relative embeddings always contain tense in Nez Perce, and that that tense is always read *de re*, we might assume that (76) is in fact the basic denotation of the relative embedding predicate (with additional variants derivable for cases with more than one *res*, as *res*-movement approaches require in general).

³²Moreover, this general approach to the descriptions involved in *de re* will sometimes get us the wrong results (Lewis 2020, 107-108). Pearson (2018) describes the problem as follows: “If Ralph did indeed see Ortcutt at the beach, and in addition he believes (de se) that he is Ronald and that some other guy is Ralph, and he says sincerely *the man Ralph saw at the beach is a spy*, then we are clearly not entitled to conclude that Ralph believes that Ortcutt is a spy” (Pearson 2018, 9).

The resulting theory offers a distinctive perspective on why it should be that *de re* readings remain available in Nez Perce relative embeddings whereas shifty indexicals and relative tenses do not. All three phenomena are in some sense built on the same core *de se* machinery, namely centered quantification. (This perspective is shared with the Concept Generators theory, discussed next.) What is distinctive about *de re* interpretation is that it involves movement outside the embedded clause to a direct argument position of the quantifying verb. Here, though crucially *not* inside the embedded clause, the grammar is able to make reference to the coordinates of the centered quantification, for the limited purpose of mediating the relationship between the embedded content and what is now an element of the matrix clause.

6.2 Concept generators

The concept generator theory of *de re*, introduced in Percus and Sauerland 2003 and adopted in much further work (e.g. Anand 2006, Charlow and Sharvit 2014, Baron 2015, Pearson 2015, Sharvit 2018, Mucha et al. 2023), seeks the same truth conditions as the *res*-movement theory, but by a distinct compositional route. A central empirical motivation for this alternative route comes from cases of ‘bound *de re*’ (Charlow and Sharvit 2014, Pearson 2015)—that is, elements that are read *de re*, but also bound internal to the embedded clause. This can be schematized as in (77), where the boxed pronoun is read *de re*.

(77) *Attitude predicate* [_{CP} 1 ... pronoun₁]

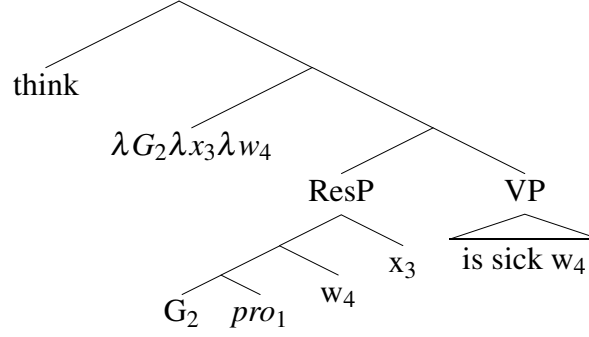
The argument goes as follows. Because it is bound internal to the embedded clause, a pronoun as in (77) cannot be interpreted entirely outside of that clause, as it would be on the *res*-movement theory. (See e.g. (68).) Accordingly, we require a way of interpreting elements *de re* while leaving them fully inside the embedded clause.³³ As we will see, this type of approach has the immediate effect that the distinction drawn by the *res*-movement theory between *de re* readings (which are *ex situ*) and (other) elements read *de se* (which remain *in situ*) cannot be maintained. On the concept generator approach, *de re* readings are like the semantics of shifty indexicals and bound tenses in that they run on centered semantics internal to the embedded clause.

Let us consider the version of the Concept Generator theory discussed by Pearson (2015), applied to the centered attitude report in (78) (which is the same example discussed above in (70)). In terms of structure, the *res* pronoun remains in situ in the embedded clause and is syntactically “wrapped” in a structure (ResP) that contributes a concept-generator variable G_n (along with other variables discussed below). In (79), following Pearson, I set aside times and events, and (contrary to the presentation elsewhere in this paper) represent world pronouns syntactically, along with world and individual syntactic binders at the edge of the clause.

(78) 'Aayat hi-neki-se- \emptyset [*pro* hi-k'oomay-ca- \emptyset].
 woman 3SUBJ-think-IMPERF-PRES [3SG 3SUBJ-be.sick-IMPERF-PRES]
 The woman thinks she is sick.

³³We also require a semantics for *de re* pronominals that remains assignment sensitive in the typical way, *pace* Ninan (2012).

(79)



The immediate complement of the attitude predicate in (79) presents three binders: one which binds the concept generator variable (λG_2), one which binds a world variable (λw_4), and, crucially, one which binds an individual variable (λx_3). The binding of this individual variable corresponds to centered quantification over individuals, as we see in the verb denotation in (80). This is a centered analysis, both as concerns the attitude predicate and as concerns its complement.

- (80) $\llbracket think_{de\ re} \rrbracket^{c,g} = \lambda P_{\langle \langle e, \langle s, \langle e, e \rangle \rangle \rangle, \langle e, \langle s, t \rangle \rangle \rangle} \cdot \lambda x. \lambda w. \exists G [G \text{ is suitable for } x \text{ in } w \text{ and } \forall \langle y, w' \rangle \in DOX(x, w) : P(G)(y)(w') = 1]$
 where $DOX(x, w) = \{ \langle y, w' \rangle : \text{what } x \text{ believes in } w \text{ is true in } w' \text{ and } x \text{ identifies themselves as } y \text{ in } w' \}$ (Pearson 2015, 86, 88)

We noted above in discussion of the *res*-movement theory that we require a description that can be evaluated under two sets of terms: those of the evaluation world, and those representing the perspective of the attitude holder. The mediating role of that description is captured on that theory via constraints on functions f (see (69)). A concept generator is a close relative of the function f , as Percus and Sauerland (2003) discuss. The concept generator variable is of type $\langle e, \langle s, \langle e, e \rangle \rangle \rangle$: it takes in the individual *res* and then world and individual parameters providing the terms of evaluation. What on the *res*-movement theory can be stated directly as constraints on f (namely: f returns the *res* when provided the evaluation world, attitude holder, attitude time; f is based on acquaintance) will now be stated as constraints on concept generator variables. These constraints are recorded as “suitability” in (80), which might be cashed out as follows:³⁴

- (81) A concept generator G is suitable for x in w iff for all u in the domain of G :
- a. $G(u)(w)(x) = u$ *Reliability*
 - b. There is an acquaintance relation R such that for all individual-world pairs $\langle y, w' \rangle$ in the domain of $G(u)$, y bears R uniquely to $G(u)(w')(y)$ in w' . *Acquaintance-based*
- (Pearson 2015, 88)

The first of these clauses enforces evaluation under the terms of the matrix clause, whereas the second clause adds evaluation under the perspective of the attitude holder. To see this, let $G(u) = \Pi$. Given that G is suitable for the attitude holder in the world of evaluation (see (80)), Π takes the world of evaluation and attitude holder and maps them to the *res*, (81a). And there is an acquaintance relation R such that for all individual-world pairs $\langle y, w' \rangle$ in the domain of Π , y bears R uniquely to $\Pi(w')(y)$ in w' , (81b). As the composition in (79) shows us, the only individual y

³⁴This is what Pearson calls the ‘standard definition’ of suitability (Pearson 2015, 88), setting aside a new amendment that she motivates.

guaranteed to be in the domain of $\Pi(w')$ is the one bound by centered quantification over individuals (x_3 in (79)). This is because the acquaintance relation we are interested in is one that holds between *the individual center of the attitude report* and the correlate (in that centered world) of the *res*. This is as on the *res*-movement theory (though arrived at in a different way), and represents the fact that for both theories, *de re* semantics runs on a central core of *de se*.

The difference from the *res*-movement theory is that centering is required not just in the type of quantification carried out by the verb, but in terms of actual variable binding in the complement. Without the individual binder and the variable it binds in (79), we would not be able to evaluate the description corresponding to the concept generator according to the attitude holder's perspective.³⁵ We thus arrive at a core clash between the central expectations of the concept generator approach regarding ingredients to *de re* readings and the conclusions of the previous sections regarding uncentered attitudes. If the concept generator theory is correct for *de re* generally, then there can be no uncentered attitude reports in which material is read *de re*. To produce a *de re* reading, we require the ingredients to *de se* readings (centered predicate, centered complement) along with an additional ingredient (concept generator variables and the ResP structures that host them). The distribution of *de se* readings should be no more constrained than the distribution of *de re* readings, then.³⁶ The facts we have considered in this paper suggest that this is false. *De re* readings can persist when (arguably simpler) *de se* devices like relative tenses and shifty indexicals are ruled out. This calls out for an approach to *de re* which either separates out *de re* readings as a grammatically distinguished type of *de se* element (as on the *res*-movement theory) or else severs the connection between *de re* and *de se* more generally. We now discuss a theory of the latter type.

6.3 Revisionism

While the two views of *de re* semantics discussed above differ in the compositional mechanisms they take to underlie attitude reports *de re*, they converge on what they take the overall truth-conditions of those attitude reports to be. The general picture is the one that comes from Kaplan (1968) and Lewis (1979). For an attitude report *de re* to be true, the attitude holder must be acquainted with the *res* in a certain way in the evaluation world; we then use that means of acquaintance to locate individuals in various other possible worlds.

We noted above the von Stechow/Abusch proposal that directly referential terms in attitude reports must always be read *de re* (von Stechow 1995). If this is so, then given the Kaplan-Lewis semantics just reviewed, we expect that directly referential terms will only be possible in attitude reports when they denote individuals that the attitude holder is acquainted with. This prediction is incorrect. Here is one of the various counterexamples discussed in the literature, from Percus (2021) (see also Sosa 1970, Bonomi 1995, Sharvit 1998, 2018, Aloni 2005, Anand 2006, Recanati 2012, Blumberg and Holguín 2018, Blumberg and Lederman 2021, Tancredi and Sharvit 2022, Sharvit and Moss 2022, Benbaji-Elhadad 2023, Mayr and Schmitt 2023, for other examples):

³⁵Note that this is intended as a point about the necessity of centering for this analysis, rather than about the need for extensional approaches to that centering.

³⁶This assumes we do not adopt *ad hoc* restrictions on binding of *de se* variables, for instance allowing them only to be bound inside a ResP but not elsewhere.

- (82) Context: Mary is flying in today on Flight AF 62. We are all eagerly awaiting her arrival. We know however that the departure was delayed and so we are not sure when exactly she will be getting in. At a certain point I remember that our friend John works at the airport, so I call him to ask if Flight AF 62 has landed. He says that he believes that in fact it has. I turn to you and tell you:

John thinks that Mary has arrived.

(Percus 2021, 24)

The challenge in this example is that the attitude holder, John, is not acquainted with Mary in any way—he has not perceived her or interacted with her; her very existence is unknown to him.³⁷ It would not do, then, to condition the truth of the sentence on the existence of an acquaintance relation between John and Mary.

A class of theories that I call ‘revisionist’ (Blumberg and Lederman 2021) respond to this puzzle with a semantics for attitude complements that takes the embedded proposition to represent not the actual beliefs of the attitude holder, but something that can be inferred (or otherwise produced) from these beliefs given additional material (Gennari 2003, Blumberg and Holguín 2018, Percus 2021, Blumberg and Lederman 2021, Tancredi and Sharvit 2022, Kratzer 2022, Benbaji-Elhadad 2023, Mayr and Schmitt 2023). For Tancredi and Sharvit (2022), for instance, (82) is true because there are beliefs *b* of John’s and beliefs *q* of the speaker’s such that the embedded proposition (*Mary has arrived*) can be inferred from the speaker’s acceptance of *b* and *q*.³⁸ In this case, John’s relevant belief is *AF 62 has landed*; the speaker’s relevant belief is *Mary is on AF 62*.

Note that centered quantification played no role in this analysis. After all, on the views discussed in previous sections, it was appeal to an acquaintance-based description applied to centered coordinates that had mandated centering, and no such descriptions play a role in the revisionist theory. This difference from earlier theories is noted explicitly by Tancredi and Sharvit (2022, 34), who formulate their version of the revisionist theory in such a way as to not require even simple possible worlds, and thus *a fortiori* not centered worlds. This means that revisionist approaches are expected to pair well with an uncentered semantics for relative complements. A relative embedding sentence with *lilooy* ‘be happy’, e.g. *A lilooy p*, is true when there are beliefs *b* of A’s (which cause happiness for A, presumably) and beliefs *q* of the speaker’s such that the embedded proposition *p* can be inferred from the speaker’s acceptance of *b* and *q*. Consider the case of an embedded tense, e.g. in (83):

- (83) Watiisx Meeli hi-llooy-ca-qa [yoŋ ke pro
 1.day.away Mary.NOM 3SUBJ-be.happy-IMPERF.REC.PAST [RP.NOM C 3SG
 hi-waaqi-sa-qa]
 3SUBJ-rain-IMPERF-REC.PAST]
 Yesterday Mary was happy that it was raining (she was enjoying the rain).

³⁷This conclusion has influenced how the examples have been described. Some have sought to reserve the term *de re* for acquaintance-based examples, whereas examples of this type instantiate some other phenomenon (Gennari 2003, Sharvit 2018, Kratzer 2022); others have resisted such a division, seeking a uniform analysis without acquaintance (Sosa 1970, Aloni 2005, Tancredi and Sharvit 2022, Mayr and Schmitt 2023). For present purposes, the question is not whether such examples deserve the *de re* moniker (as opposed to ‘pseudo-*de re*’, as per Sharvit 2018, or even ‘non-*de dicto*’, as per Mayr and Schmitt 2023) but rather what their semantic analysis is.

³⁸I set aside some additional qualifications; see Tancredi and Sharvit (2022, 11).

Assuming, as above, that the embedded tense in (83) is pronominal and carries an index (say, 2), let us treat the embedded proposition in (83) as *rain*(*g*(2)). For the sentence to be true, Mary must have a belief *b* that causes her happiness; this is the belief that rain obtains at her present time, call this *t*₁. The embedded proposition *rain*(*g*(2)) can be inferred from the speaker's acceptance of *rain*(*t*₁) (=Mary's belief *b*) along with an additional belief of the speaker's, *q*. A natural candidate for *q* is simply the belief that *t*₁ = *g*(2).

Revisionist theories offer a natural explanation for why *de re* readings should pattern differently from dedicated *de se* devices such as shifty indexicals or relative tenses. *De re* does *not*, on these theories, run on a *de se* core; it runs, rather, on a system of inferences that produce the embedded clause. No surprise, then, that *de re* readings should be possible in uncentered attitude reports. It would in fact be surprising for these theories if this were not so.

6.4 Discussion: *res*-movement, revisionism, and the ULC

We have seen that *res*-movement theories and revisionist theories each offer a means of interpreting directly referential terms in relative complements. Before concluding this section I wish to offer one final comment on the comparison between these theories, concerning a detail in the behavior of embedded tense.

It is commonly noted that tenses read *de re* are subject to a limitation that Abusch (1997) called the Upper Limit Constraint (ULC): a *de re* tense cannot denote a time later than the 'internal now' of the attitude report. As applied to *de re* tenses in Nez Perce relative complements, the ULC predicts that it should be impossible to embed a recent past tense under a remote past tense. This prediction is correct.³⁹

- (84) # Waqiipa *pro* hi-llooy-ca-na [yô ke weet'u picpic
 while.back 3SG 3SUBJ-be.happy-IMPERF-REM.PAST [RP.NOM C NEG cat.NOM
 hi-wii-ca-qa]
 3SUBJ-cry-IMPERF-REC.PAST]
 Literally: A while back she was happy that the cat wasn't crying.


It also correctly predicts that present tense cannot be embedded in such complements under past tense of any type:

- (85) # Watiisx Meeli hi-llooy-ca-qa [yô ke
 1.day.away Mary 3SUBJ-be.happy-IMPERF-REC.PAST [RP.NOM C
 hi-weeqi-se-∅]
 3SUBJ-rain-IMPERF-PRES]
 Literally: Yesterday Mary was happy that it is raining.

How might we capture this limitation?

Consider the analysis delivered for this type of sentence on the *res*-movement approach. The structure involves *res*-movement of the embedded tense to an argument position of *lilooy*, (86). (In this structure I have given each tense an index, as our general approach to tense requires (59), and annotated it with a superscript for its remoteness feature.)

³⁹It is possible that this type of example becomes acceptable when consultants are explicitly provided with a double-access context. Unfortunately, this data is not available.

- (86) *Res*-movement of tense, (85)
 $[_{TP} T_1^{rec} [_{VP} [lilooy \text{ 'be happy' } T_2^{pres}] [_{CP} 3 [_{TP} t_3 [rain]]]]]$


By applying (76) we arrive at (87) (abbreviating the non-doxastic elements of verb meaning):

- (87) $\llbracket (85) \rrbracket^{c,ig}$ is defined if $g(1)$ is shortly before t_i and $g(2) = t_i$.
 When defined, $\llbracket (85) \rrbracket^{c,ig} = 1$ iff $yesterday(g(1)) \wedge \exists e.g(1) \subseteq \tau(e) \wedge \exists f.[f(Mary, \tau(e), w_i) = g(2) \wedge acquaintance-based(f) \wedge \forall \langle y, l, t', w' \rangle \in DOX(Mary, \tau(e), w_i) : \exists e'[rain(e') \wedge \tau(e') = f(y, t', w')] \wedge w' \text{ is more desirable to Mary} \dots$

For these truth-conditions to be met, there would need to be an acquaintance relation that relates Mary at a past time to the current time. One intuition about the source of the ULC is the idea that such conditions cannot be satisfied (see Abusch 1997, Anand and Hacquard 2008b, and discussion in Arregui 2022). One can be acquainted with times in the past, or the time of the present, in ways that one simply cannot be acquainted with the future.⁴⁰ This means that the sentence in (85) is expected to be false (or indeed a presupposition failure, if as per Heim (1994) one treats the acquaintance requirement as a presupposition), explaining its infelicity.⁴¹

Can a purely revisionist approach to embedded tense deliver the same result? The role of acquaintance in the argument just given suggests that the answer is no. On a revisionist approach, (85) might instead be expected to work exactly parallel to (83) (where *de re* tense yielded a simultaneous reading).⁴² As for that example, let us schematize the embedded proposition in (85) as $rain(g(2))$; the difference is just that now $g(2)$ is presupposed to be our present time. Mary has a belief b that causes her happiness, held at a time t_r in the recent past; this is the belief that it would not rain *at a time in the future of t_r* , call this t_1 . The embedded proposition $rain(g(2))$ can be inferred from the speaker's acceptance of $rain(t_1)$ (=Mary's belief b) along with an additional belief of the speaker's, $t_1 = g(2)$. On these grounds we might incorrectly predict the sentence in (85) to be perfectly felicitous.

Where does this put us regarding the analysis of material read *de re* in relative complements? I see three possible ways forward. First, it is clear, on revisionist theories, that revisions must be in some way constrained; exactly how to state these constraints is a topic of current debate (see Blumberg and Lederman 2021, Tancredi and Sharvit 2022, Benbaji-Elhadad 2023, Mayr and Schmitt 2023, for various perspectives). It may then be that a better understanding of these constraints paves a way to an alternative understanding of the ULC data that does not involve acquaintance. If this is so, then the revisionist approach could be all we need.

Second, it could be that acquaintance is truly required for *de re* readings in Nez Perce relative complements. If this is so (which remains unknown, unfortunately; Nez Perce judgments corre-

⁴⁰The idea that one cannot be acquainted with the future in the sense relevant for attitudes *de re* runs into long-known difficulties with temporal adverbs (Abusch 1997, von Stechow 1995, Sharvit and Moss 2022). I return to the tense/adverbial distinction and its import for *de re* semantics below.

⁴¹A possible way out is a double-access reading, as noted by Abusch (1997). The reasoning discussed here delivers the absence of a pure 'forward shifted' reading, whereby the embedded event time is strictly in the future of attitude time.

⁴²Indeed the type of approach outlined here is suggested in Gennari (2003, 66n17), though Gennari does not discuss the ULC.

sponding to English cases like (82) are not available), then we would have grounds to prefer a pure *res*-movement solution.

Third, it could be that a hybrid account is merited. Data from adverbials is suggestive here. As noted already by Abusch (1997), the ULC behavior just discussed—that is, that embedded tenses cannot receive ‘forward shifted’ interpretations—is a behavior specific to tenses. It does not apply to temporal adverbs, for instance *yesterday* in (88) (from von Stechow 1995) or Nez Perce *piilepti-pe ka’aw-pa* ‘on Thursday’ in (89) (repeated from (45)):

(88) Four days ago Sue believed that she would be sick yesterday

(89) Hal̥paawit-pa *pro* lilooy-ca-qa [yo̯ ke-x lepwey-pe *pro*
 Sunday-LOC 1SG be.happy-IMPERF-REC.PAST [RP.NOM C-1 Lapwai-to 1SG
 paay-no’ piilepti-pe ka’aw-pa]
 come-PROSP four-LOC day-LOC]
 On Sunday I was happy that I would come to Lapwai Thursday.

For von Stechow (1995, n 9), such data are grounds to reject Abusch’s acquaintance-based reasoning for the ULC. Here is a different way forward: accept the acquaintance-based account of the ULC, *specifically for embedded tense*, and pursue a non-acquaintance-based analysis of adverbs such as those in (88)-(89). This proposal relates to Kratzer’s (1998, 105) suggestion that *res*-movement may be appropriate only for tense, whereas other types of *de re* readings are derived via separate mechanisms. Suppose these mechanisms are revisionist. It would follow that *de re* readings in relative complements have two separate sources. Tense is interpreted via *res*-movement (explaining the ULC) whereas all other interpretation *de re* results from revisionist sources.

7 Alternatives

We have seen how departing from Uniformity, and treating relative embedding reports as uncensored attitude reports, allows for the behavior of embedded indexicals and tenses to be captured. Let us now consider two types of Uniformity-preserving alternative analyses.

A first alternative is a syntactic approach: relative embedding complements express centered propositions, like their simplex embedding counterparts do, and provide these centered propositions to centered quantification in the attitude predicate—but there is some reason why first person pronouns and tenses cannot be bound by this quantification in relative embeddings. For first persons, such a restriction could be accomplished by a ban on OP_{auth} operators in relative embedding clauses. (This is not a ban that could follow from (66), note; OP_{auth} , if present in this scenario, would not be vacuous.) This type of ban faces an immediate challenge in accounting for why locative indexical shift is not entirely ruled out in relative embeddings. As we saw in section 2.2, simplex embedding clauses in which person indexicals do not shift do not allow locative indexicals to shift (see (20)). This was accounted for in section 4 by a syntactic proposal, maintained throughout the discussion above: OP_{LOC} may only be present if OP_{auth} also is. This leads us to expect that relative embeddings, in which first persons do not shift, should also entirely disallow locative shift. But this is not the case. Thus, adopting a ban on OP_{auth} operators in relative embeddings requires us to find an alternative explanation for the complex interplay between embedding type, person shift, and locative shift:

(90) Shifting possibilities by embedding type

	Simplex embedding	Relative embedding
No shift	✓	✓
Person shift only	✓	✗
Person and locative shift	✓	✗
Locative shift only	✗	%

It is not clear what type of explanation for this pattern is available on a purely syntactic approach.

Matters are still trickier for tenses. Given that tenses are sensitive to local evaluation time (modeled as temporal information from the index), a tense that remains inside the scope of a centered attitude quantifier must always be bound by the quantifier. Ruling out the bound reading requires moving the embedded tense outside the scope of the quantifier. While this movement itself may recall the *res*-movement approach to tenses outlined in section 6, the motivations for that movement do not carry over. On the uncentered *res*-movement approach, the tense must move because it cannot be interpreted *in situ*. There is no way to produce temporal *de se*, given uncentering. Thus, given Abusch’s Constraint, *de re* interpretation is required, and *res*-movement is required for composition. On a Uniformity-obeying approach, by contrast, tenses *can* be interpreted *in situ* perfectly well in relative complements, just like in simplex complements. It remains unclear what type of principle could be invoked to make their movement obligatory, then.

A final remark about a syntactic account is that it makes it a sort of accident that relative embeddings resist exactly those two behaviors that are linked to *de se*. For instance, on a theory in which syntactic principles dictate which shifty operators a clause can contain (Sundaresan 2011, Deal 2020), we expect that a language might contain clauses that cannot contain shifty operators alongside clauses that can. Insofar as their syntax is parallel, *de se* and non-*de se* shifty operators should behave alike in terms of these patterns. But there is no expectation that tense should follow any parallel pattern, since tenses involve binding rather than indexical shift. What we find in the Nez Perce complement type alternation analyzed here is a quite different pattern. Shifty operators show two different behaviors, depending on whether or not they invoke a *de se* semantics. And tense patterns with *de se* indexical shift.

A second alternative is a semantic account that ties the special behavior of relative embedding verbs not to uncenteredness but to factivity. Notably, other cases of “disappearing *de se* phenomena” have been noted in factive complements: for instance, in certain factive complements in Russian (Grønn and von Stechow 2010) and Japanese (Ogihara and Sharvit 2012), instead of a typical relative tense we find tense *de re*. Such findings might suggest a principle of one sort or another that rules out dedicated *de se* devices in factive complements purely in view of the factive inference associated with these complements. I will not attempt to formulate a principle like this, however, because in spite of this suggestive crosslinguistic pattern, I do not think its empirical prospects are very strong. For one thing, in Russian and in Japanese, relative tense is not entirely ruled out in factive complements. Russian allows (but doesn’t require) present-under-past for simultaneous readings in factives (Grønn and von Stechow 2010); Japanese tense shows speaker variation (Ogihara and Sharvit 2012). In Nez Perce, by contrast, relative tense is entirely unavailable in relative complements. Appealing to the crosslinguistic behavior of factives thus does not seem likely to yield a strong enough restriction for the behavior of embedded tense.

There are also challenges internal to Nez Perce. One comes from the behavior of *cuukwe* ‘know’, a simplex embedding verb. This verb shows factive behavior, as we see in (91) below. For

this example, consultants were presented with a Nez Perce sentence with no English translation. (I parenthesize a translation below.) The sentence contained an attitude report in a downward entailing context. Speakers were then asked a question which probed for an inference to the complement proposition. (This methodology follows Tonhauser et al. 2013.) As (91) shows, consultants endorsed the complement proposition. This pattern held constant across five *cuukwe* elicitations following this design, featuring knowledge reports embedded in yes-no questions, antecedents of conditionals, and under sentential negation. By contrast, in controls using the same methodology but the verb *neki* ‘think’, speakers did not once endorse the complement proposition.

(91) Linguist: “Suppose you overheard this:

C’alawi sepehiteemenew’eet hi-cuukwe-ce- \emptyset [’iin
 if teacher.NOM 3SUBJ-know-IMPERF-PRES [1SG.NOM
 k’oomay-ca- \emptyset], weet’u *pro* hi-cewcew-nuu-yu’-kum *pro*
 be.sick-IMPERF-PRES] NEG 3SG 3SUBJ-call-APPL-PROSP-CIS 1SG
 (If the teacher knows that I am sick, she won’t call me.)
 Would you think that person was ill?”

Consultant: “Well, I would think that person WAS ill. So he or she will not call her, if she knows.”

The same type of data points to factivity for relative embedding complements, (92). (In (92), speakers were asked both a control question (whether the husband was happy) and the target question (whether the dog went back).) This pattern is also highly replicable: it held constant across nine elicitations, featuring a range of relative embedding verbs (*lilooy* ‘be happy’, *cicwaay* ‘be surprised’, *timiipni* ‘remember’, *tim’neeneki* ‘worry, be anxious’) and a range of DE contexts.

(92) Linguist: “Suppose you overheard this:

Weet’u ’in-haama hi-llooy-ca- \emptyset [yo \hat{x} ke Fido
 NEG 1SG-husband.NOM 3SUBJ-be.happy-IMPERF-PRES [RP.NOM C Fido.NOM
 hi-ckiliitoq- \emptyset -a]
 3SUBJ-go.back-P-REM.PAST]
 (My husband isn’t happy that Fido went back.)
 Would you think the husband was happy?”

Consultant: “No.”

Linguist: “Would you think the dog went back?”

Consultant: “Went back, uh-huh (yes). Wherever he came from.”

Given that we find an inference to the complement out of a DE environment both for *cuukwe* ‘know’ and for relative embedding verbs such as *lilooy* ‘be happy’, a principle that ruled out *de se* devices in factive complements would be expected to treat these two kinds of verbs the same way. But this is incorrect, as we saw in section 2: *cuukwe* ‘know’ allows first person indexical shift, (21), and embeds present tense with a simultaneous reading, (26)-(27).⁴³

⁴³There are of course many proposals that seek to subdivide the class of factives, considering the inference to the complement either from English knowledge verbs (e.g. Karttunen 1971) or from English emotive factives (e.g. Gazdar 1979) less than fully reliable. As it turns out, the data that

A last data point to demonstrate that factive complements do not categorically reject dedicated *de se* devices comes from English. Consider what happens when an emotive factive predicate such as *be happy* occurs with a non-finite complement, as in (93). In this environment, PRO retains its dedicated *de se* semantics, as shown by the contrast between the two contexts below.

(93) Sue is happy [PRO to have left].

- a. ✓ Context 1: Sue was organizing a large corporate party at a local bar. Midway through the party, the bar had a power outage, and Sue and most of her colleagues fled to another bar. Looking back, she thinks this was the right decision.
- b. ✗ Context 2: Sue was organizing a large corporate party at a local bar. Midway through the party, she received an emergency call, and had to leave unexpectedly. This made her very sad. Later, she was told that according to the bouncer, only one person from the company had left early. She concluded that this person was probably a party-pooper and it was a good thing that he or she left early. It turned out this person was actually Sue herself—a possibility she had not considered (as she assumed the bouncer wouldn't count her).

At the same time, the predicate retains its factivity: the standard family of sentences built from (93) (e.g. *Is Sue happy to have left?*, *Sue isn't happy to have left*) all give rise to the inference that Sue did, in fact, leave. English nonfinite-embedding *be happy* thus forms a minimal contrast with Nez Perce relative-complement-taking *lilooy* 'be happy': both are emotive factives, but only English *be happy* allows dedicated *de se* devices in its complement. I conclude that both factivity generally and the particular semantics of emotive factives more specifically are insufficient to rule out *de se* phenomena in relative complements in Nez Perce. An additional factor, correlated with complement type, is required. Uncenteredness provides this piece.

All of this is not to say that the factivity of relative embedding verbs is a mere accident. I suggest, however, that the explanation runs in the opposite direction of the one just pursued. On the uncentered analysis, the complement of a relative embedding verb expresses a classic proposition, type $\langle s, t \rangle$, picking out a set of possible worlds. Note that this kind of semantic object is particularly suitable for veridical inferences, as the proposition p may be simply applied to the evaluation world, $w_c \in p$. Thus the denotation for *lilooy* proposed above in (75) could readily be modified to encode an inference to the complement:⁴⁴

$$(94) \quad \llbracket \textit{lilooy} \text{ 'be happy'} \rrbracket^{c,i} = \lambda p_{\langle s, t \rangle}. \lambda e. \lambda x. \boxed{p(w_c) = 1} \wedge \forall \langle y, t', w' \rangle \in DOX^h(x, \tau(e), w_i) : p(w') = 1 \wedge w' \text{ is more desirable to } x \text{ at } \tau(e) \text{ in } w_i \text{ than is any of the nearest } \neg p \text{ worlds}$$

motivate both sides of this discussion can be replicated in Nez Perce—e.g. Nez Perce speakers allow the equivalent of “Don't leave! If I find out [*cuukwe*] you left, I'll be mad” as well as “Mary thought it was Sunday and was happy [*lilooy*] she could sleep in. But it was Thursday—no way could she sleep in!”. Given that both types of verbs allow us to avoid the veridical inference in at least some cases, I refrain from assigning any explanatory power to a further subdivision of verbs based on factivity-avoidance behavior.

⁴⁴It of course remains to tangle with the (familiar-from-English) issues raised in the previous footnote. Furthermore, the veridical entailment must either be specially lexically marked as projective, or a general pragmatic algorithm must specify that this entailment projects (Simons 2001, Abrusán 2011, Anand and Hacquard 2014).

has argued—in its case, shifted person indexicals and a class of logophor-like elements that Deal (2018b, 2020) calls *indexiphors*. Out of all the attitude predicates in the language, these two devices are both restricted to complements of the verb meaning ‘say’. Deal (2018b) gives this fact a syntactic implementation: both shifted indexicals and indexiphors require some type of CP-level operator (though the operator is different in the two cases) and it so happens that only ‘say’ complements can host the operators involved. Perhaps a deeper explanation is within reach here if only ‘say’ complements express centered propositions in Amharic. Indexical shifting and indexiphoric operators are both possible in these complements, as both live on centered quantification over individuals. But other complements do not express centered propositions, and therefore do not provide the semantic ingredients for shifty readings of indexicals or indexiphors. Further work is required to assess this hypothesis empirically, and in particular, to assess its interaction with Amharic embedded tense. Certainly, if this proposal is sustained, it suggests that the correlation between uncenteredness and factivity is not a crosslinguistically reliable one (as Amharic has many nonfactive attitude predicates beyond ‘say’).

References

- Abrusán, Márta. 2011. Predicting the presuppositions of soft triggers. *Linguistics and Philosophy* 34:491–535.
- Abusch, Dorit. 1988. Sequence of tense, intensionality and scope. In *Proceedings of WCCFL 7*, 1–14.
- Abusch, Dorit. 1997. Sequence of tense and temporal de re. *Linguistics and Philosophy* 20:1–50.
- Akolkar, Shweta. 2024. Shifty first person inclusive and *de re*-free domains in Marathi. Poster presented at SALT 34, May 2024.
- Akolkar, Shweta, and Sansan Claude Hien. 2024. *De re* readings of the Lobi logophoric pronoun. Presented at TripleA, Nantes, June 2024.
- Aloni, Maria. 2005. A formal treatment of the pragmatics of questions and attitudes. *Linguistics and Philosophy* 28:505–539.
- Altshuler, Daniel, and Roger Schwarzschild. 2013. Moment of change, cessation implicatures and simultaneous readings. In *Proceedings of Sinn und Bedeutung 17*, ed. E. Chemla et al., 45–62.
- Anand, Pranav. 2006. *De de se*. Doctoral Dissertation, MIT.
- Anand, Pranav, and Valentine Hacquard. 2008a. Epistemics with attitude. In *SALT XVIII*, ed. T. Friedman and S. Ito, 37–54. Ithaca, NY: CLC Publications.
- Anand, Pranav, and Valentine Hacquard. 2008b. When the present is all in the past. In *Recent advances in the syntax and semantics of tense, mood and aspect*, ed. L. de Saussure et al., 209–228. Mouton de Gruyter.
- Anand, Pranav, and Valentine Hacquard. 2014. Factivity, belief and discourse. In *The Art and Craft of Semantics: A Festschrift for Irene Heim*, ed. Luka Crnić and Uli Sauerland.
- Anand, Pranav, and Andrew Nevins. 2004. Shifty operators in changing contexts. In *Proceedings of SALT XIV*, ed. Robert B. Young, 20–37. Ithaca, NY: CLC Publications.
- Anvari, Amir. 2019. Meaning in context. Doctoral Dissertation, École Normale Supérieure.
- Aoki, Haruo. 1970. *Nez Perce grammar*. Berkeley: University of California Press.
- Aoki, Haruo. 1994. *Nez Perce dictionary*. Berkeley: University of California Press.

- Arregui, Ana. 2022. On Abusch's "sequence of tense and temporal de re". In *A Reader's Guide to Classic Papers in Formal Semantics*, ed. Louise McNally and Zoltán Gendler Szabó, 1–16.
- Bar-Lev, Moshe. 2015. *De re* tenses and trace conversion. *Proceedings of SALT* 25 184–203.
- Baron, Christopher. 2015. Generalized concept generators. *Proceedings of NELS* 46:59–68.
- Bassi, Itai, Imke Driemel, Abigail Anne Bimpeh, and Silvia Silleresi. 2023. Decomposing logophoric pronouns: a presuppositional account of logophoric dependencies. Manuscript, November 2023.
- Benbaji-Elhadad, Ido. 2023. Preliminaries for a substitution theory of *de re*. *Proceedings of SALT* 33 358–378.
- Bimpeh, Abigail Anne. 2023. Logophoricity: an empirical-semantic assessment of *yè* in Ewe. Doctoral Dissertation, Goethe-Universität Frankfurt.
- Blumberg, Kyle, and Ben Holguín. 2018. Ultra-liberal attitude reports. *Philosophical Studies* 175:2043–2062.
- Blumberg, Kyle, and Harvey Lederman. 2021. Revisionist reporting. *Philosophical studies* 178:755–783.
- Bochnak, Ryan, Vera Hohaus, and Anne Mucha. 2019. Variation in tense and aspect, and the temporal interpretation of complement clauses. *Journal of Semantics* 36:407–452.
- Boër, Steven, and William G. Lycan. 1980. Who me? *The Philosophical Review* 89:427–466.
- Bonomi, Andrea. 1995. Transparency and specificity in intentional contexts. In *On Quine*, ed. Paolo Leonardi and Marco Santambrogio, 164–185.
- Cable, Seth. 2013. Beyond the past, present and future: Towards the semantics of 'graded tense' in Gĩkũyũ. *Natural Language Semantics* 21:219–276.
- Cable, Seth. 2015. Graded tenses in complement clauses: Evidence that future is not a tense. Handout, UMass.
- Cable, Seth. 2017. The implicatures of optional past tense in Tlingit and its implications for 'discontinuous past'. *Natural Language and Linguistic Theory* 35:635–681.
- Caponigro, Ivano, and Maria Polinsky. 2011. Relative embeddings: a Circassian puzzle for the syntax/semantics interface. *Natural Language and Linguistic Theory* 29:71–122.
- Charlow, Simon, and Yael Sharvit. 2014. Bound *de re* pronouns and the LFs of attitude reports. *Semantics and Pragmatics* 7:1–43.
- Chen, Sihwei, Jozina Vander Klok, Lisa Matthewson, and Hotze Rullmann. 2021. The 'experiential' as an existential past: evidence from Javanese and Atayal. *Natural Language and Linguistic Theory* 39:709–758.
- Chierchia, Gennaro. 1989. Anaphora and attitudes *de se*. In *Semantics and contextual expression*, ed. R. Bartsch, Johan van Benthem, and P. van Emde Boas, 1–31. Dordrecht: Foris.
- Cinque, Guglielmo. 1999. *Adverbs and functional heads: a cross-linguistic perspective*. New York: Oxford University Press.
- Cresswell, Maxwell J, and Arnim von Stechow. 1982. *De re* belief generalized. *Linguistics and Philosophy* 5:503–535.
- Crook, Harold David. 1999. The phonology and morphology of Nez Perce stress. Doctoral Dissertation, University of California, Los Angeles.
- Deal, Amy Rose. 2009. Events in space. In *Proceedings of SALT XVIII*, ed. T. Friedman and S. Ito, 230–247. Ithaca, NY: CLC Publications.
- Deal, Amy Rose. 2010a. Ergative case and the transitive subject: a view from Nez Perce. *Natural Language and Linguistic Theory* 28:73–120.

- Deal, Amy Rose. 2010b. Topics in the Nez Perce verb. Doctoral Dissertation, University of Massachusetts, Amherst.
- Deal, Amy Rose. 2014. Nez Perce embedded indexicals. In *Proceedings of SULA 7: Semantics of Under-Represented Languages in the Americas*, ed. H. Greene, 23–40. Amherst, MA: GLSA Publications.
- Deal, Amy Rose. 2015a. Interaction and satisfaction in ϕ -agreement. In *Proceedings of NELS 45*, ed. Thuy Bui and Deniz Özyıldız, 179–192. Amherst, MA: GLSA Publications.
- Deal, Amy Rose. 2015b. A note on Nez Perce verb agreement, with sample paradigms. In *Proceedings of the International Conference on Salish and Neighbouring Languages 50*, ed. Natalie Weber et al., 389–413. Vancouver: UBC Working Papers in Linguistics.
- Deal, Amy Rose. 2016. Cyclicity and connectivity in Nez Perce relative clauses. *Linguistic Inquiry* 47:427–470.
- Deal, Amy Rose. 2017a. Covert hyperraising to object. In *Proceedings of NELS 47*, ed. Andrew Lamont and Katerina Tetzloff, 257–270. Amherst, MA: GLSA Publications.
- Deal, Amy Rose. 2017b. Shifty asymmetries: universals and variation in shifty indexicality. Manuscript, UC Berkeley, March 2017.
- Deal, Amy Rose. 2018a. Compositional paths to *de re*. In *Proceedings of SALT 28*, ed. Sireemas Maspong et al., 622–648. Ithaca, NY: CLC Publications.
- Deal, Amy Rose. 2018b. Indexiphors: notes on embedded indexicals, shifty agreement, and logophoricity. In *The Leader of the Pack: a Festschrift in Honor of Peggy Speas*, ed. Rodica Ivan, 59–86. Amherst, MA: GLSA Publications.
- Deal, Amy Rose. 2020. *A theory of indexical shift: meaning, grammar, and crosslinguistic variation*. Cambridge, MA: MIT Press.
- Deal, Amy Rose. 2024. Clausal complementation as relativization, revisited. Manuscript, UC Berkeley.
- Deal, Amy Rose. To appear. Person features and shiftiness. In *The alphabet of universal grammar*, ed. D. Harbour et al. Oxford University Press.
- Gazdar, Gerald. 1979. *Pragmatics: implicature, presupposition, and logical form*. Academic Press.
- Gennari, Silvia P. 2003. Tense meanings and temporal interpretation. *Journal of Semantics* 20:35–71.
- Grønn, Atle, and Arnim von Stechow. 2010. Complement tense in contrast: the SOT parameter in Russian and English. In *Russian in Contrast*, ed. Atle Grønn and Irena Marijanovic, 2, 109–153. Oslo: University of Oslo.
- Haida, Andreas. 2009. (Proto-)logophoricity in Tangale. Handout from NELS 40, MIT, <http://patrickgrosz.org/haida-talk.pdf>, November 2009.
- Harbour, Daniel. 2016. *Impossible persons*. Cambridge, MA: MIT Press.
- Heim, Irene. 1992. Presupposition projection and the semantics of attitude verbs. *Journal of Semantics* 9:183–221.
- Heim, Irene. 1994. Comments on Abusch’s theory of tense. In *Ellipsis, tense and questions*, ed. Hans Kamp, 143–170. Amsterdam: University of Amsterdam.
- Heim, Irene, and Angelika Kratzer. 1998. *Semantics in generative grammar*. Malden, MA: Blackwell.
- Hintikka, Jaakko. 1969. Semantics for propositional attitudes. In *Models for modalities*, 87–111. D. Reidel Publishing Company.

- Kaplan, David. 1968. Quantifying in. *Synthese* 19:178–214.
- Kaplan, David. 1989. Demonstratives: An essay on the semantics, logic, metaphysics, and epistemology of demonstratives and other indexicals. In *Themes from Kaplan*, ed. Joseph Almog, John Perry, and Howard Wettstein, 481–564. Oxford: Oxford University Press.
- Karttunen, Lauri. 1971. Implicative verbs. *Language* 47:340–358.
- Keshet, Ezra. 2010. Split intensionality: A new scope theory of *de re* and *de dicto*. *Linguistics and Philosophy* 33:251–283.
- Klecha, Peter. 2016. Modality and embedded temporal operators. *Semantics and Pragmatics* 9:1–55.
- Kratzer, Angelika. 1998. More structural analogies between pronouns and tenses. In *Proceedings of SALT VIII*, ed. Devon Strolovitch and Aaron Lawson, 92–110. Ithaca, NY: CLC Publications.
- Kratzer, Angelika. 2006. Decomposing attitude verbs. Talk given at The Hebrew University of Jerusalem, July 2006.
- Kratzer, Angelika. 2022. Attitude ascriptions and speech reports. In *Linguistics Meets Philosophy*, 17–50. Cambridge: Cambridge University Press.
- Kubota, Yusuke, Jungmee Lee, Anastasia Smirnova, and Judith Tonhauser. 2009. On the cross-linguistic interpretation of embedded tenses. In *Proceedings of Sinn und Bedeutung 13*, ed. Arndt Rieger and Torgrim Solstad, 307–320.
- Kusumoto, Kiyomi. 1999. Tense in embedded contexts. Doctoral Dissertation, University of Massachusetts Amherst.
- Kusumoto, Kiyomi. 2005. On the quantification over times in natural language. *Natural Language Semantics* 13:317–357.
- Ladusaw, William A. 1977. Super Equi NP deletion and the Direct Discourse Analysis. *Linguistic Inquiry* 8:742–744.
- Lewis, David K. 1979. Attitudes *de dicto* and *de se*. *Philosophical Review* 88:513–543.
- Lewis, David K. 2020. *Philosophical letters of David K Lewis*, volume 2: Mind, language, epistemology. Oxford University Press.
- Maier, Emar. 2009. Presupposing acquaintance: a unified semantics for *de dicto*, *de re* and *de se* belief reports. *Linguistics and Philosophy* 32:429–474.
- Maier, Emar. 2011. On the roads to *de se*. In *Proceedings of SALT 21*, 393–412.
- Matthewson, Lisa. 2004. On the methodology of semantic fieldwork. *International Journal of American Linguistics* 70:369–415.
- Mayr, Clemens, and Viola Schmitt. 2023. Non-*de dicto* construals as a uniform phenomenon. Presented at PhLiP, Tarrytown, November 2023.
- Morgan, Jerry L. 1970. On the criterion of identity for noun phrase deletion. In *Proceedings of the Sixth Regional Meeting of the Chicago Linguistics Society*.
- Moulton, Keir. 2015. CPs: copies and compositionality. *Linguistic Inquiry* 46:305–342.
- Mucha, Anne. 2015. Temporal interpretation and cross-linguistic variation. Doctoral Dissertation, University of Potsdam.
- Mucha, Anne, Agata Renans, and Jacopo Romoli. 2023. Sequence of tense and cessation implicatures: Evidence from Polish. *Natural Language and Linguistic Theory* 41:267–346.
- Ninan, Dilip. 2012. Counterfactual attitudes and multi-centered worlds. *Semantics and Pragmatics* 5:1–57.
- Nishiguchi, Sumiyo. 2017. Indexical shifting in Dhaasanac and Somali. In *Proceedings of TripleA 3*, ed. Vera Hohaus and Wanda Rothe, 47–55. Tübingen: Universitätsbibliothek Tübingen.

- Ogihara, Toshiyuki. 1989. Temporal reference in English and Japanese. Doctoral Dissertation, University of Texas at Austin.
- Ogihara, Toshiyuki. 1995a. Double-access sentences and reference to states. *Natural Language Semantics* 3:177–210.
- Ogihara, Toshiyuki. 1995b. The semantics of tense in embedded clauses. *Linguistic Inquiry* 26:663–680.
- Ogihara, Toshiyuki. 1996. *Tense, attitudes, and scope*. Dordrecht: Kluwer Academic.
- Ogihara, Toshiyuki. 1999. Double access sentences generalized. In *Proceedings from SALT IX*, ed. T. Matthews and D. Strolovitch, 224–236. Ithaca, NY: CLC Publications.
- Ogihara, Toshiyuki, and Yael Sharvit. 2012. Embedded tenses. In *The Oxford Handbook of Tense and Aspect*, ed. Robert I. Binnick, 638–668. Oxford: Oxford University Press.
- Park, Yangsook. 2016. Indexical shift and the long-distance reflexive *caki* in Korean. Manuscript, University of Massachusetts, Amherst.
- Pearson, Hazel. 2015. The interpretation of the logophoric pronoun in Ewe. *Natural Language Semantics* 23:77–118.
- Pearson, Hazel. 2018. Counterfactual de se. *Semantics and Pragmatics* 11.
- Pearson, Hazel. 2021. Attitude verbs. In *The Wiley Blackwell Companion to Semantics*, ed. Daniel Gutzman, Lisa Matthewson, Cécile Meier, Hotze Rullmann, and Thomas Ede Zimmerman, 1–22.
- Percus, Orin. 2021. Index-dependence and embedding. In *The Wiley Blackwell Companion to Semantics*.
- Percus, Orin, and Uli Sauerland. 2003. On the LFs of attitude reports. In *Proceedings from Sinn und Bedeutung* 7, ed. M. Weisgerber, 228–242. Konstanz: University of Konstanz.
- Recanati, François. 2012. *Mental files*. Oxford University Press.
- Reinhart, Tanya. 1990. Self-representation. Lecture delivered at Princeton conference on anaphora, October 1990.
- Rizzi, Luigi. 1997. The fine structure of the left periphery. In *Elements of grammar*, ed. Liliane Haegeman, 281–337. Dordrecht: Kluwer Academic.
- Rude, Noel. 1985. Studies in Nez Perce grammar and discourse. Doctoral Dissertation, University of Oregon.
- Sauerland, Uli. 2014. Counterparts block some ‘de re’ readings. In *The Art and Craft of Semantics: A Festschrift for Irene Heim*, ed. Luka Crnić and Uli Sauerland, volume 2, 65–85. MITWPL.
- Schlenker, Philippe. 1999. Propositional attitudes and indexicality: a cross-categorical approach. Doctoral Dissertation, MIT.
- Schwager, Magdalena. 2011. Speaking of qualities. In *Proceedings of SALT 19*, 395–412.
- Sharvit, Yael. 1998. Individual concepts and attitude reports. In *Proceedings of SALT VIII*, ed. Devon Strolovitch and Aaron Lawson, 233–248. Ithaca, NY: CLC Publications.
- Sharvit, Yael. 2014. On the universal principles of tense embedding: the lesson from *before*. *Journal of Semantics* 31:263–313.
- Sharvit, Yael. 2018. Sequence of tense: syntax, semantics, pragmatics. In *Pronouns in embedded contexts at the syntax-semantics interface*, ed. Pritty Patel-Grosz, Patrick Grosz, and Sarah Zobel, 215–247. New York: Springer.
- Sharvit, Yael, and Matt Moss. 2022. Acquaintance relations. In *Linguistics Meets Philosophy*, 51–73.

- Simons, Mandy. 2001. On the conversational basis of some presuppositions. In *Proceedings of SALT XI*, ed. Rachel Hastings, Brendan Jackson, and Zsolia Zvolenszky, 431–448. Cornell University, Ithaca, NY: CLC Publications.
- Smith, Carlota S. 1978. The syntax and interpretation of temporal expressions in English. *Linguistics and Philosophy* 2:42–99.
- Sosa, Ernest. 1970. Propositional attitudes *de dicto* and *de re*. *Journal of Philosophy* 67:883–896.
- Stalnaker, Robert. 1981. Indexical belief. *Synthese* 49:129–151.
- von Stechow, Arnim. 1995. On the proper treatment of tense. In *Proceedings of SALT V*, ed. Mandy Simons and Teresa Galloway, 362–386. Ithaca, NY: Cornell University.
- von Stechow, Arnim. 2003. Feature deletion under semantic binding: tense, person and mood under verbal quantifiers. In *Proceedings of NELS 33*, ed. Makoto Kadowaki and Shigeto Kawahara, 379–404. Amherst, MA: GLSA Publications.
- von Stechow, Arnim, and Thomas Ede Zimmermann. 2005. A problem for a compositional treatment of *de re* attitudes. In *Reference and Quantification: the Partee Effect*, ed. Greg Carlson and Francis Jeffrey Pelletier, 207–228. Stanford: CSLI Publications.
- Stowell, Tim. 1996. The phrase structure of tense. In *Phrase structure and the lexicon*, ed. Joan Rooryck and Laurie Zaring. Kluwer.
- Sudo, Yasutada. 2012. On the semantics of phi features on pronouns. Doctoral Dissertation, MIT.
- Sundaresan, Sandhya. 2011. A plea for syntax and a return to first principles: monstrous agreement in Tamil. In *Proceedings of SALT 21*, ed. Neil Ashton, Anca Chereches, and David Lutz, 674–693. Ithaca, NY: CLC Publications.
- Tancredi, Christopher, and Yael Sharvit. 2022. Belief or consequences. *Semantics and Pragmatics* 15.
- Tonhauser, Judith, David Beaver, Craige Roberts, and Mandy Simons. 2013. Toward a taxonomy of projective content. *Language* 89:66–109.
- Tsilia, Anastasia. 2021. Embedded tense: Insights from Modern Greek. Master’s thesis, École Normale Supérieure, Paris.
- Yang, Charles D. 2000. Internal and external forces in language change. *Language Variation and Change* 12:231–250.
- Yang, Charles D. 2004. Universal grammar, statistics or both. *TRENDS in Cognitive Sciences* 8:451–456.
- Zamparelli, Roberto. 1995. Layers in the determiner phrase. Doctoral Dissertation, University of Rochester.