Chapter 1

Reporting with clausal embedding and without: Another look at the Pirahã controversy

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This chapter explores the relation between the syntax of clausal embedding and the ability to represent what others are saying, thinking, dreaming etc.. I'm using the Pirahã controversy as a lens through which to study this relationship because, supposedly, the Pirahã language has no clausal embedding and hence no analogue of English indirect discourse (*Katy said/thought/dreamed that she was rich*). I first show how hearsay evidentiality and direct quotation, both of which are attested in Pirahã, differ semantically from each other and from indirect discourse. However, together, these two arguably embedding-free report strategies could cover two of the most common uses of indirect discourse in English, viz. (i) efficient communication that keeps track of speaker's evidential sources through a not-at-issue information channel, and (ii) vivid description of speech and thought in narratives. I also argue that reporting in general is best understood as a discourse phenomenon, only optionally encoded in the grammar. Spelling this out in a formally explicit and independently motivated general model of discourse structure and coherence relations (including a non-veridical relation of Attribution) we actually derive Dan Everett's own diagnosis of the situation, viz. that "there can be recursive discourses in the absence of recursive sentences."

1 Embedding, reporting, and recursion in language and mind

One of the semantic uses of clausal embedding is metarepresentation, i.e., the linguistic representation of a representation. In other words, clausal embedding

helps us describe the contents of mental states or speech acts. Indeed, the clausal embedding syntax that we see for instance in English *that*-clauses seems like a natural fit for this communicative purpose. I will refer to the canonical clausal-embedding-based metarepresentational report structures like (1) as indirect discourse, regardless of whether they represent the content of a speech act or a mental state.

(1)   Mel believes that COVID is a hoax.

When we say (1) we're communicating a complex proposition (that Mel believes that COVID is a hoax), which contains a simpler proposition (that COVID is a hoax). Clauses are the syntactic vehicles for expressing propositions, and indeed the clausal embedding syntax mirrors this nested structure of metarepresentation: the complex clause (1) as a whole expresses the complex proposition, and the smaller embedded clause nested inside expresses the simpler one.

Crucially, such nested structures, both in thought and in language, are recursive. Once we know how to form a metarepresentation like that in (1) we can form an even more complex one by ascribing an attitude with that propositional content to someone else:

(2)   Sia suspects that Mel believes that COVID is a hoax.

The intimate relationship between metarepresentation and the syntax of clausal embedding lies at the heart of an influential hypothesis about Theory of Mind development known as Linguistic Determinism (De Villiers & De Villiers 2000; De Villiers & Roeper 2022), which posits that the ability to reason about others' (possibly false) beliefs is causally dependent on the linguistic acquisition of clausal embedding structures like (1).

Interestingly, another controversial hypothesis that has likewise garnered vehement debate among linguists is one that points in the opposite direction, i.e., against the assumed interdependence of complex thought and clausal embedding syntax. This is Everett's (2005) claim that the Amazonian language Pirahã lacks recursion altogether (Nevins et al. 2009; Everett 2010). In particular, Everett maintains that the Pirahã language does not have anything resembling the English indirect discourse constructions exemplified in (1) and (2). Yet surely Pirahã speakers will occasionally want to report what so-and-so told them, what someone else thought about this or that, or perhaps even what someone said so-and-so told them they were thinking about what they dreamed last night[1] – all

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[1]A strict reading of Everett's (2005) sociological reflections (including the highly controversial

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things we naturally express in English by means of indirect discourse constructions, i.e., by (recursively) generating clausal embeddings. If the link between clausal embedding and complex attitude ascription (or reasoning) is as fundamental as suggested above, how do the Pirahã or other communities that lack clear analogues of English indirect discourse[2] talk about these things?

Languages offer a wealth of linguistic report-related strategies that might allow us to fulfill some or all of the functions that English fulfills with indirect discourse. These include such constructions known as hearsay evidentials (Murray 2017), reportative moods (Fabricius-Hansen & Sæbø 2004), and reportative modals (Schenner 2009); direct discourse and mixed quotation (Maier 2014); pragmatic perspective shifts (Harris & Potts 2010); parenthetical reports (Simons 2007; Hunter 2016); free indirect discourse (Banfield 1982); speech balloons (Maier 2019), etc.. In this chapter I want to take a closer look at the most salient of these reportative phenomena, hearsay evidentials (Section 3) and direct discourse (Section 4), as it is entirely uncontroversial that Pirahã employs these as report strategies. I tentatively conclude from these investigations that it is not a priori implausible that a language could employ precisely these two functionally disjoint constructions to dramatically reduce the need for an all-purpose report strategy like English indirect discourse. After that I explore Everett's own alternative but compatible diagnosis of the Pirahã situation, which involves analyzing reporting as a discourse phenomenon rather than as an essentially grammatical construction (Section 5). But first I briefly review the syntax and semantics of the recursive clausal embedding report strategy of indirect discourse (Section 2).

2 The syntax and semantics of indirect discourse

2.1 Modifying contentful events

Following Kratzer 2006, it has become increasingly standard to treat canonical report constructions (and modals) in terms of *contentful eventualities* (Hacquard

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Immediacy of Experience principle) might suggest otherwise. I will not discuss these alleged cultural constraints here. In any case, as we'll see, the Futrell 2019 corpus contains plenty of examples of reported speech.

[2]I'm focusing on Pirahã, but as Pullum & Scholz 2010; Pullum 2020 stresses, Pirahã is by no means unique in this respect. Pullum cites linguists describing various languages as lacking clausal complementation, from Proto-Uralic and ancient Akkadian to Dyirbal (Australian Aboriginal) and Hixkaryána (Amazonian, unrelated to Pirahã) (see Pullum 2020 for references and discussion).

2010; Moulton 2009; Kratzer 2016). Take our basic indirect thought report in (1), repeated in (3-a). A neo-Davidsonian logical form would look like (3-b).[3]

(3) a.   Mel believes that COVID is a hoax.
     b. $\exists e.believe(e) \wedge agent(e, mel) \wedge content(e, \lambda w.hoax_w(covid))$

The report asserts the existence of a belief state, e, experienced by Mel, whose content corresponds to the proposition that COVID is a hoax. A belief state is an example of a contentful eventuality, i.e., an event or state that represents the world as being a certain way, and hence can be said to have propositional content. Instead of giving a precise definition, let me just note that events like running and states like being asleep clearly lack representational content, while saying, dreaming, and hoping are usually characterized as having such contents – you can say or hope that p, where p corresponds to a proposition that can be true or false.

Traditionally, the semantics of speech and attitude reports is formulated in terms of modal operators (Hintikka 1969; Kaplan 1989). Instead, we follow Kratzer 2006, who proposes a logical form like (3-b) where it's the event of saying or the state of hoping that carries the content. Formally, this means we have a relation $content(e, p)$ that relates an eventuality e to its propositional content p (a set of possible worlds).

Both traditional and event-based frameworks admit a straightforward compositional implementation in a Montague/Heim&Kratzer-style syntax–semantics interface. Briefly, all verbs (stative, eventive, transitive, intransitive, contentful, etc.) simply introduce properties of eventualities (v is the type for eventualities, t for truth values):

(4) $\llbracket believes \rrbracket = \lambda e.believe(e)$ (type: $\langle v, t \rangle$)

Arguments like subjects, direct objects, but also complement clauses and adverbial modifiers, are likewise analyzed as properties of eventualities. Without going into details, the subject term, *Mel*, in our example will be analyzed as follows:

(5) $\llbracket Mel \rrbracket = \lambda e.agent(e, mel)$ (type: $\langle v, t \rangle$)

A complementizer, silent or pronounced, turns a proposition into, again, an eventuality property. The embedded clause has to be interpreted as denoting a propo-

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[3]Notation: I suppress reference to world variables unless they are locally bound, in which case I add them as subscripts to predicates. I use *agent* as a neutral eventuality predicate, covering experiencers of states and agents of events.

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sition (type $\langle s, t \rangle$, with s for possible worlds) to serve as input for the complementizer, i.e. we apply what Heim & Kratzer 1998 call Intensional Function Application (IFA) to combine (6-a) and (6-b) into (6-c):

(6)   a. $[\![\text{COVID is a hoax}]\!] = hoax(covid)$ (type: t)
       b. $[\![\text{that}]\!] = \lambda p \lambda e.content(e, p)$ (type: $\langle \langle s, t \rangle, \langle v, t \rangle \rangle$)
       c. $[\![\text{that COVID is a hoax}]\!] = \lambda e.content(e, \lambda w.hoax_w(covid))$ (type: $\langle v, t \rangle$)

We now use the Predicate Modification (PM) rule to conjoin the various eventuality properties, and then apply the Existential Closure (EC) rule to the resulting big event property to turn it into a proposition.

(7) $[\![\text{Mel believes that COVID is a hoax}]\!]$

$= \lambda e.believe(e) \oplus \lambda e.agent(e, mel) \oplus \lambda e.content(e, \lambda w.hoax_w(covid))$

(combining (4), (5), (6))

$= \lambda e.believe(e) \wedge agent(e, mel) \wedge content(e, \lambda w.hoax_w(covid))$ (by PM)

$= \exists e.believe(e) \wedge agent(e, mel) \wedge content(e, \lambda w.hoax_w(covid))$ (by EC)

It's easy to verify that the event-based analysis of indirect discourse sketched above, like its Hintikkan predecessor, admits the observed recursive self-application▌ by design:

(8)   a.   Sia suspects that Mel believes that COVID is a hoax.
       b. $\exists e.suspect(e) \wedge agent(e, sia) \wedge content(e, \lambda w[\exists e'.believe_w(e') \wedge$
$\wedge agent_w(e', mel) \wedge content_w(e', \lambda w'.hoax_{w'}(covid))])$

2.2 Pinpointing Pirahã exceptionality

Assuming the basic semantics of indirect discourse we can now be more precise about what it might mean to say, as Everett does, that Pirahã does not have it. The anecdotes and stories recorded in the Pirahã corpus (Futrell 2019) show that Pirahã has verbs of e.g. saying and dreaming that are used to introduce and describe events of those types.[4] General semantic composition rules like Function Application, Predicate Modification and Existential Closure are likewise indispensable (for simple things like verbs taking arguments, as in *Kate smiled*). Hence, the only ingredient that might, conceivably, be lacking is an operator like the English complementizer *that*, i.e., something that takes a proposition and turns it into

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[4]E.g., see 2019:8.1 for a story about someone reporting a dream in which someone is telling him something.

a property of eventualities.[5] Indeed, semantically speaking, we could maintain that it is this operator that is responsible for the clausal embedding, as it takes a proposition as input and yields as output something that is straightforwardly turned into a proposition (via EC).[6]

Having reviewed an uncontroversial basic analysis of reporting through clausal embedding, and the diagnosis it implies for Pirahã's alleged exceptionality, in the next two sections we turn to two alternative types of constructions attested in Pirahã that fulfill functions overlapping those of indirect discourse.

3 Hearsay evidentials

3.1 Evidentials in Pirahã

Languages have various ways to mark what evidence one has for the truth of the proposition asserted. In some languages, speakers obligatorily mark on the verb whether they have for instance direct, perceptual evidence for the proposition, or merely indirect, hearsay evidence. In Pirahã, evidentiality is obligatorily marked by verbal affixes: *-híai* 'hearsay'; *-sibiga* 'deduction'; *-ha* 'complete certainty'; *-∅* 'direct knowledge' (Futrell et al. 2016).[7]

(9) hi oaí -xi -isai   -híaha   (Pirahã)
     he die be OLD-INFO HEARSAY
     (I heard that, as has been mentioned,) he died. (Futrell 2019:5.41.1)

Hearsay evidentials can take over some of the functions that might otherwise be fulfilled by indirect discourse. This is evident from the fact that paraphrases of hearsay evidentials typically involve indirect speech (someone told me that he died) or indirect reception reports (I heard that he died). It is also clear that any productive indirect discourse construction is more expressive than an evidential system. First of all, the number of different evidential morphemes is typically much smaller than the number of different speech, thought, perception, and attitude verbs. Furthermore, those different verbs can each be further modified

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[5]I'm following Kratzer's (2006) original proposal. Different later developments introduce for instance more complex structures than just the complementizer intervening between the verb and the complement clause (Kratzer 2016; Maier 2018).

[6]I'm disregarding the option that what's lacking is the IFA rule because that rule is inextricably linked up with the existence of something like our complementizer: without a complementizer, IFA would do nothing, and vice versa.

[7]This list of affixes is taken from Futrell et al. 2016. All Pirahã glosses below are taken from Futrell 2019.

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indefinitely (*Sia told Jan yesterday, in the garden, sobbing uncontrollably, that he died*) in a way that evidentials cannot – most hearsay evidentials don't even have a slot for specifying the source from which the speaker heard the information, let alone the manner, time, or location (Bary & Maier 2021). Below I explore to what extent hearsay evidentials nonetheless constitute a viable alternative way of speaking about what was said, and whether it really is free of clausal embedding.

3.2 Hearsay evidentials vs. indirect discourse

A key feature of evidentiality is that the content contributed by an evidential is not-at-issue, i.e., a mere supplement to the main content (e.g. Murray 2017). Being not-at-issue means, for instance, that the evidential component cannot address the current question under discussion (Simons et al. 2011).[8] This is illustrated with an example in the evidential language Gitksan below:

(10) A: gu   gan   ha'niigood-in win sin-hun=s   John ky'oots?
          what reason think.2SG   COMP hunt-fish=PN John yesterday
          (Gitksan)

          'Why do you think John went fishing yesterday?' / 'What's your evidence to think that John went fishing yesterday?'
      B: #sin-hun=gat   John ky'oots.
          hunt-fish=HEARSAY John yesterday
          'John went fishing yesterday, I'm told.' (Bary & Maier 2021)

Importantly, indirect discourse paraphrases that likewise contribute the information that someone told the speaker something *are* felicitous in response to an evidence question, meaning that the speech act information in indirect discourse can be construed at-issue.

(11) A: Why do you think John went fishing? What's your evidence?
      B: Someone told me that he went fishing.

Note that the logical form we posited in 2.1 above for indirect discourse would predict the observed felicity of (11) and hence, in the current terminology, it constitutes a logical form where the reporting event is at-issue. This is not to deny

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[8]Other characteristics of evidentials that confirm the not-at-issue status of the reporting content include the fact that that content is not easily challenged directly, and that it projects out of embeddings (Bary & Maier 2021).

that in the right context indirect discourse can also be used more "evidentially", i.e., with the reported proposition becoming at-issue and the reporting itself becoming a not-at-issue supplement specifying the source of the at-issue information.

(12) A: Where's John?
      B: Someone told me that he went fishing.

I refer to Simons 2007; Hunter 2016; Bary & Maier 2021 for semantic analyses of these two different readings of indirect discourse, i.e., (i) the regular, fully at-issue report reading exemplified in (11) and modeled in Section 2, and (ii) the not-at-issue, parenthetical, or evidential reading exemplified in (12). The takeaway message for now is that hearsay evidentials at best can take over the latter use of indirect discourse.

3.3 The semantics of evidentials

To account for the not-at-issue characteristics observed for evidentials, Bary & Maier 2021 propose a rather different logical form for evidential reports than the one we've seen for indirect discourse where the speech event is at-issue. At-issue and not-at-issue contents are represented at different dimensions, as in (13). Notation: $hear.compat(i, w)$ in the metalanguage abbreviates that world w is compatible with the information that the current speaker i heard.

(13) $[\![\text{HEARSAY}]\!] = \lambda p \left\langle \begin{array}{c} p \\ \forall w(hear.compat(i, w) \rightarrow p(w)) \end{array} \right\rangle$

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ (type: $\langle\langle s, t\rangle, \langle s, t\rangle \times t\rangle$)

Applying this operator to the interpretation of the actual clause it marks (e.g. *John went fishing yesterday*), via Intensional Function Application, gives a 2D logical form that presents a proposition (that John went fishing yesterday) as the at-issue contribution (on top) while communicating that the current speaker heard that John went fishing yesterday as a not-at-issue supplement (bottom):

(14) $[\![(10)\text{B}]\!] = \left\langle \begin{array}{c} \lambda w'.fish_{w'}(john, yesterday) \\ \forall w(hear.compat(i, w) \rightarrow fish_w(john, yesterday)) \end{array} \right\rangle$

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ (type: $\langle s, t\rangle \times t$)

Bary & Maier 2021 further outline a discourse update model in the style of Farkas & Bruce 2009 to describe how such a 2D interpretation affects the current discourse record. Roughly: (i) add the not-at-issue component (that the speaker

heard that John went fishing) to the common ground; (ii) check whether asserting that the at-issue proposition is true would address the current QUD; (iii), if so, put a proposal to the effect that that proposition must be true on the table for discussion;[9] and finally, (iv), unless challenged, accept the proposal on the table by adding it to the common ground.

3.4 Evidentials, embedding, and Pirahã

Let's assume that the hearsay evidential affix *híai* (HEARSAY) behaves roughly like other hearsay evidentials cross-linguistically. We can then assume it to have a two-dimensional not-at-issue semantics like (13). From the point of view of the syntax–semantics interface then this operator takes a propositional object ('he died') as input and yields a pair of propositional objects (at issue = 'he died' ; not-at-issue = 'I heard that he died') as output. Interestingly, this semantics suggests a slightly different syntactic parse (viz., evidential as clausal operator) than what Futrell et al.'s (2016) glosses suggest (viz., evidential as verbal modifier).

(15) $[\![\,[\,[\,\text{he died} \dots]\,\text{-HEARSAY}\,]\,]\!] = [\![\text{HEARSAY}]\!](\lambda w.die_w(x)) =$

$$= \left\langle \begin{array}{c} \lambda w.die_w(x) \\ \forall w'(hear.compat(i, w') \rightarrow die_{w'}(x)) \end{array} \right\rangle$$

On this semantic, type-driven analysis we might technically call the Pirahã evidential construction a clausal embedding construction, because in the composition the simple clause is fed into the evidential operator to construct the eventual sentence interpretation. However, evidential systems tend to lack the crucial feature of recursivity that the Pirahã controversy was really about. In Pirahã for instance we only have one slot for evidential marking on the verb so it's not clear how we could possibly express evidence about evidence in this way – to the extent that evidentially expressing second-order evidence even makes any practical communicative sense (¿I heard that I heard that he died').[10]

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[9]Following Hunter 2016, Bary & Maier 2021 add a contextually restricted modal hedging of the proposal in step (iii) to account for the observation that in many evidential languages one can use a hearsay evidential without fully committing to the actual truth of the proposition (a phenomenon AnderBois 2014 calls *reportative exceptionality*).

[10]I'm strictly talking about recursive embedding of evidentiality, not embedding of evidentials in other reporting constructions (see Korotkova 2021 for an in-depth exploration of the cross-linguistic variation in embeddability of evidentials in indirect discourse constructions) or the other way around. In the Pirahã corpus we see both of these: direct discourse report complements may contain an evidential marker, and the reporting verb of the report will itself also contain an evidential, see (19) below.

In conclusion, evidentiality is useful in everyday conversation where we're talking about what the world around us is like. It allows us to keep track of the strength of evidence for various claims being put on the table. The not-at-issueness of evidential contributions allows for a smooth update negotiation process by keeping the evidence information – which we typically wouldn't want to argue about anyway because speakers tend to be authorities on whether they've heard or seen something – out of the way. Hearsay evidentials in particular can be used to convey, in that unobtrusive not-at-issue way, that someone told you something. English indirect discourse can be used both to convey, at-issue, that a speech or thought event took place, and to convey some at-issue proposition, together with a not-at-issue evidential supplement. That latter function of indirect discourse clearly overlaps with the function of evidentials. As we'll see below, the former function instead arguably overlaps with that of quotation.

4 Quotation

4.1 The semantics and pragmatics of direct discourse

Evidentiality can be extremely useful for efficiently maintaining a functioning common ground. But this kind of efficiency is not always the ultimate goal of communication. Sometimes we want to talk about a speech act, i.e., not just about the information that was conveyed by it, but also about who said something, how, where, why, or when. This happens for instance when we're telling stories, rather than discussing where to turn left, or how long to cook broccoli. Telling a good story usually involves vivid descriptions of the dialogue between characters, or even their thoughts and desires. Evidential constructions by their nature are not suitable for this, because the reporting is not-at-issue and hence not amenable to vivid elaboration.

Indirect discourse constructions do allow us to talk about the speech event itself, adding adverbial and other event modifiers along with the content specification.

(16)   As she got up, she told him sternly not to call her.

Hans-Martin Gärtner (p.c.) points out that the morphosyntax of the evidential may be a factor in licensing embeddability, providing the following example of embedding of a reportative modal (*wollen*) under a hearsay modal (*sollen*) in German as a potential example of evidential-under-evidential embedding: *Hans soll in Amsterdam gewesen sein wollen* ('Hans reportedly claims to have been in Amsterdam').

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But indirect discourse is not the only construction that storytellers use to describe what people are saying or thinking. For even more vivid speech representation we can use different forms of quotation. We focus here on the canonical form of quotational reporting, viz., direct discourse:

(17)   "No…wait, don't leave me!", he begged her.

With direct discourse, the author or speaker can describe more vividly what characters are saying than with indirect discourse, because they're not presenting merely the *content* of what was said, but the actual *words* that character themselves originally chose to express that content.[11]

Formally, then, direct discourse differs from indirect discourse in specifying not the content of what was said, but its linguistic surface form. We can thus capture this by replacing the $content(e, p)$ relation in the logical form of indirect discourse exemplified in (3), with a $form(e, s)$ relation, relating a speech event e to its linguistic surface form s. That means we need a way to refer to linguistic forms in the metalanguage, for which we can use strings of letters surrounded by Quine corners $\ulcorner, \urcorner$ constituting an entity of type u (Potts 2007; Maier 2014; Koev 2016).[12]

(18) $\exists e.beg(e) \land agent(e, x) \land form(e, \ulcorner$no …wait, don't leave me$\urcorner)$

Direct discourse has been claimed to be a linguistic universal, and indeed, looking at the translations and the glosses, the stories in the Pirahã corpus appear to be full of direct discourse reports:

(19)   hi gá   -sai   -híai   kabatíí is   aíbao Pirahã
        he speak OLD-INFO HEARSAY *tapir   animal much*
        'He said, "There are lots of tapir"'(12.41 in Futrell 2019)

The glosses provided in the Pirahã corpus mostly label reported clauses with the general category Q(uotation), but Futrell et al. 2016 adds that direct and indirect are often indistinguishable. Sauerland 2018 similarly tries to remain neutral with respect to whether similar reports in his experiment constitute direct or indirect discourse, and Everett 2010 adopts the view that the line between direct and indirect discourse is blurry (cf. Evans 2012; Spronck & Nikitina 2019). All this

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[11]In addition, depending on language and register, direct discourse constructions tend to allow a much greater range of descriptive verbs in the reporting frame than indirect discourse (*"Well eh now eh, …" he stuttered/faltered/raised his voice/…* (Saban 1978; Fónagy 1986)

[12]A proper compositional implementation would involve a quotative analogue of IFA called Quotational Function Application (Sudo 2013; Maier 2018).

suggests that, in Pirahã, direct and indirect discourse are all but interchangeable – at least, we might add, in the narrative domain where they are both used to vividly describe someone's speech or thoughts.

4.2 Direct vs. indirect discourse

Although the discourse functions of direct discourse constructions seem to partially overlap with those of indirect discourse, the semantics differs, as formally captured in the switch from *content* to *form* in our logical forms. In the following I group the main linguistically observable characteristics that semanticists use to diagnose quotation in two main clusters: perspective shift, i.e., quotation forces everything inside to be interpreted "from the perspective of the reported speaker", and opacity, i.e., quotation severs syntactic and semantic dependencies between material inside and outside the quotes. I'll show that for both of these characteristics, there are interfering factors that complicate the diagnosis. In Section 4.3 I return to the central issues, i.e., clausal embedding, Pirahã, and recursion.

4.2.1 Quotation shifts perspective

Although perspective is a notion that is notoriously hard to pin down, it seems fairly uncontroversial to say that a perspective shift involves a way of presenting what some other (timeslice of an) individual than the current speaker is thinking, seeing, or saying that somehow reflects the original subjective experience of that other. In language we have various perspective-sensitive expressions, including indexicals *I, here, today*, etc., whose reference changes under a perspective shift. Focusing on the behaviors of classic indexicals we see a clear perspectival difference between direct and indirect discourse: the reference of *I* changes under quotation, indicating a perspective shift, but not in indirect discourse.

(20) a. When I talked to him, Sayeed said "I'm a hero"
      b. When I talked to him, Sayeed said I'm a hero

Although the perspective-shifting nature of direct discourse is indeed widely accepted, the status of indirect discourse with respect to perspective shifting is more controversial. If we look beyond first-person pronouns we see a variety of indexicals and other arguably perspectival expressions that occasionally or necessarily shift also in indirect discourse (*now, here, actually, tasty, the idiot, come*, cf. recent overviews by Bylinina et al. n.d. and Anderson 2020).

In fact, if we look beyond English, we find many languages for which it is claimed that all or most indexicals, including first-person, can or even must be shifted in indirect discourse embeddings, more or less as in quotation (Schlenker 2003; Anand 2006; Deal 2020).

(21) Sue   hi-i-caa-qa   'iin k'oomay-ca-∅   Nez Perce
      Sue.NOM 3SUBJ-say-IMPERF-REC.PAST 1S   be.sick-IMPERF-PRES
      Sue$_i$ said that she$_i$'s sick (Deal 2020)

In simple, isolated examples like (21), or the Pirahã example in (19) for that matter, it's not actually clear whether we're even dealing with indexical-shifting indirect discourse or rather with a form of direct discourse (*Sue said "I'm sick"*). To distinguish between these options we turn to the opacity criteria.

4.2.2 Quotation is opaque

Quotation is often said to be opaque, meaning that it blocks syntactic and semantic dependencies between material inside and outside the quote (Anand 2006; Cappelen & Lepore 2012; Maier 2014). A variety of linguistic opacity tests has emerged to tease apart direct and indirect discourse, independently of observed perspective shifting.

First, direct discourse blocks wh-movement. Imagine overhearing Sam saying he forgot to call someone yesterday but you didn't catch the name. You can ask for clarification with a wh-question in indirect discourse, (22-a), but not in direct discourse, (22-b).

(22) a. Who$_i$ did Sam say she forgot to call __$_i$ yesterday?
      b. *Who$_i$ did Sam say, "I forgot to call __$_i$ yesterday"?

Similarly, negative polarity items in a report can be licensed by a negation outside the report clause in indirect discourse, but not in direct discourse.[13]

(23) a. She didn't$_i$ say that she'd ever$_i$ seriously consider it.
      b. *She didn't$_i$ say, "I'll ever$_i$ seriously consider it"

Other opacity checks include the blocking of de re readings in direct discourse, and a block on anaphora and ellipsis dependencies in direct discourse.[14]

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[13](23-b) is ungrammatical only with respect to the indexing that is meant to indicate that the NPI *ever* is licensed by the negation in *didn't*.

[14]Checks based on the *verbatimness requirement* of direct as opposed to indirect discourse are not entirely straightforward to apply because verbatimness is gradable. Especially in colloquiual

We can now apply, say the wh-movement test to verify that the ambiguous report in (21) is not direct discourse, and hence must involve indexical-shifting (aka "monstrous")[15] indirect discourse:

(24) Isii-ne$_2$ A.   hi-i-caa-qa   cewcewin'es-ki *pro*
      who-NOM A.NOM 3SUBJ-say-IMPERF-REC.PAST phone-with   1SG
      'e-muu-ce-∅?   Nez Perce
      3OBJ-call-IMPERF-PRES?
      'Who did A. say she was calling? (Deal 2020)

4.3 Intensionality, recursion, role shift, and Pirahã

There are various differences between direct and indirect discourse, but both are flexible and common ways of reporting a variety of intentional states and events. It's not prima facie absurd then to assume that reporting in some languages more heavily relies on a combination of hearsay evidentials and direct discourse, at the expense of indirect discourse. To investigate if this is indeed what's going on in Pirahã we would have to first use our perspective shift and opacity tests to verify that the kinds of reports glossed in the corpus as *quotational* are indeed direct rather than indirect.

As for perspective shift we do indeed see that even first person indexicals are typically shifted in speech reports, but as we just saw that is compatible with both a direct discourse analysis and a monstrous indirect discourse analysis. To decide the matter we'd have to look for signs of opacity. Unfortunately, as far as I'm aware, data on wh-movement, NPI-licensing, de re readings and the like are not available – and as we know from previous investigations of opacity, e.g. in sign language research (see below), clear data are not that easy to elicit.

At this point, let's take a step back and return to the root of the Pirahã controversy: recursion. The controversy arose from Chomsky's claim that recursion is at the heart of the human capacity for language (Hauser et al. 2002), and Everett's claim that Pirahã lacks recursion. Clausal embedding constructions, and indirect discourse in particular, are the prime examples of linguistic recursion. The reason for this is that indirect discourse is not only recursive but also intensional: the truth value of *Ann said she caught a fish* is independent of the truth

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settings quotations are almost never expected to be word-for-word reproductions of previous speech acts (Tannen 1989; Clark & Gerrig 1990; Maier 2014).

[15]In the terminology of Kaplan's (1989) Logic of Demonstratives, a *monstrous* operator is one that affects the semantic interpretation of indexicals in its scope (Kaplan 1989).

value of the embedded proposition, that Ann caught a fish.[16] As Sauerland 2018 points out, it's exactly that property of intensionality that makes the recursion in indirect discourse clausal embeddings ineliminable. You can paraphrase other forms of grammatical recursion, like the possessor construction in (25-a), in a clearly non-recursive way:

(25) a. Marek's sister's son is sleeping.
      b. Marek has a sister and she has a son and he is sleeping.

We can't really do such a recursion-free paraphrase with indirect reports, says Sauerland, because lifting the embedded clause to main clause level has the automatic effect of committing the speaker to its truth. His example of a failed paraphrase is (26), where we indeed lose the intensionality:

(26) a. John believes that he didn't do anything wrong.
      b. John didn't do anything wrong and he believes/knows it. (Sauerland 2018)

In Section 5 I show that, depending on the discourse context, genuinely unembedded, unquoted main clauses *can* be interpreted intensionally, i.e., as part of a report at the level of discourse representation. For now, I just want to point out that, even if the grammar of English indirect discourse were ineliminably recursive and intensional, this cannot be an argument for why a language would need indirect discourse, because direct discourse is equally recursive and intensional.

The intensionality of direct discourse is obvious: a direct report like *John said "I didn't do anything wrong"* can be true (or false) regardless of whether he in fact did something wrong. As for recursion, here's a perfectly grammatical and understandable example of a direct quote in a direct quote in a direct quote:

(27) In a recent interview, Jaden Smith said "My dad once told me, he was like, 'The only time you should lie is when someone's holding a gun to your head and says "Okay, lie or I'm going to shoot you"'" (adapted from https://www.azquotes.com/quote/1011081)

As with indirect discourse there seems to be no principled upper limit to the nesting of quotations – there's even a well-known recursive typographical convention to deal with them in print (viz., alternate double and single quotation

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[16]We're focusing here on the narrative, at-issue use of indirect discourse. On an evidential, not-at-issue reading, intensionality is not straightforward because then the embedded proposition is itself presented as the at-issue contribution of the entire speech act (see Section 3.3).

marks). Nor is the phenomenon just an artificial invention based on the practice of writing quotation marks, we can easily imagine an unambiguously articulated spoken version of (27).[17]

In sum, it doesn't really matter for the big theoretical debate whether Pirahã has an indirect discourse construction with proper clausal complements. Instead the relevant question is whether the quotation construction allows recursive self-application, the way English quotation evidently does.

Again, unfortunately, clear examples like (27) are lacking for Pirahã. There is however another, more accessible group of languages for which there is an ongoing debate about the correct syntactic and semantic analysis of its reporting constructions. Many sign languages employ a construction called role shift in which a signer reports what someone said, signed, or thought, by shifting their head, body, or eye-gaze and "demonstrating" the original act of speech, thought, or signing (Quer 2016; Steinbach 2021).

Although more empirical research is required here too – there is some debate about, for instance, the status of wh-movements in role shift in ASL (Davidson 2015; Schlenker 2017) – so the question whether role shift constructions in various sign languages are forms of direct or indirect discourse is far from settled. More importantly, for our investigation into the recursion controversy, Quer (p.c.) shares the following Catalan Sign Language (LSC) example of role shift in role shift, strongly suggesting the construction is recursive.[18]

(28)   JOAN IX3a 3-SAY-1 <role-Joan MARIA IX3b THINK> <role-Maria VOTE
         FOOLISHNESS>
         'Joan told me that Maria says voting is silly' (LSC, Quer p.c.)

Let's take stock. In Section 3 above we saw how evidentiality is not a genuine substitute for indirect discourse generally, but may well substitute for a specific, not-at-issue use. The other salient use of indirect discourse, prevalent in narrative, then arguably overlaps with direct discourse. We've also seen that the line between direct and indirect discourse is not always easy to draw, and that, regardless, direct discourse is equally recursive as indirect discourse. We can conclude

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[17]With deeper levels of quotation embedding it quickly becomes tedious to pronounce and hard to interpret out of context, but the same is true for multiply embedded indirect speech reports.

[18]Notational conventions of sign language glossing: lexical signs are represented as capitalized English words; *IX3a* represents an index finger pointing (*IX*) to a specific, abstract non-speaker/addressee (*3*) locus (*a*) in the so-called signing space in front of the signer; *<role-Joan …>* represents the signer's non-manual marking (head tilt, body lean, breaking of eye contact) of a shift of their frame of reference to Joan while signing the material inside the angle brackets.

from all this that, perhaps, a combination of hearsay evidentiality and direct discourse, both uncontroversially attested in Pirahã, may well cover a wide range of reporting functions English speakers might associate with indirect discourse.

On the one hand my diagnosis agrees with Everett's in that I see no need to assume that Pirahã would need the kind of clausal embedding we see in English indirect discourse. On the other hand, when it comes to recursion, the analysis sketched thus far tentatively suggests, contra Everett, that direct discourse (cross-linguistically) may be just as inherently recursive as indirect discourse. Below I explore an alternative, though fully compatible, diagnosis of the Pirahã reporting situation that is, perhaps, more in line with Everett's own.

5 Towards a discourse-structural account of reporting

Everett himself does not, as far as I can tell, very explicitly endorse the above tentative diagnosis that the main functions of English indirect reporting are taken over by a combination of hearsay evidentiality (in real-world information-transmission settings) and direct discourse (in narrative settings), perhaps because it still implies the use of an inherently recursive construction, viz. direct discourse. Instead he suggests a different reconciliation of the posited lack of clausal embeddings with the assumption that Pirahã, like us, occasionally engage in metarepresentation, i.e., entertaining thoughts about thoughts, or expressing speech about speech. (Everett 2010) in particular argues that "there can be recursive discourses in the absence of recursive sentences."

In this section I explore Everett's suggestion and provide independent evidence for its plausibility. I appeal to the well-established discourse semantics framework of Segmented Discourse Representation Theory (SDRT, Asher & Lascarides 2003) and propose that reporting in general, whether direct, indirect, or something in between, is best viewed as a discourse phenomenon, modeled by way of a coherence relation called Attribution. This coherence relation, like many others, may in some languages be explicitly encoded in the grammar, but need not always be.

5.1 Representing discourse structure and coherence

Interpreting a discourse involves more than just interpreting its individual sentences. Take (29).

(29)   Jin is crying. Sun lied to him.

A reader will infer not just the conjunction of (i) there's an ongoing state of Jin crying and (ii) at some time in the past there was an event of Sun lying to Jin, but also that there is some connection between (i) and (ii), probably that Jin's crying is caused by Sun's lying. In terms of coherence relations, the hearer infers an Explanation relation between the two elementary discourse units, (i) and (ii). This relation is not linguistically expressed, but inferred in order to create a maximally coherent interpretation.

Theories of discourse coherence assume a finite set of cognitively grounded coherence relations, including Explanation, Background, Narration, Contrast and more, each with its own presuppositional, discourse-structural, and semantic contribution (Hobbs 1979; Mann & Thompson 1988; Kehler 2002; Asher & Lascarides 2003). Crucially, coherence relations may be left implicit, as in (29), but they can often be made explicit, for instance with a conjunction like *because*, as in (30):

(30)   Jin is crying because Sun lied to him.

In this case the Explanation relation is explicitly and unambiguously encoded in the grammar, but the eventual discourse interpretation is the same for (30) as for (29).

Let me introduce some of the basic notations and terminology of SDRT, a formally explicit, well-established, comprehensive semantic theory of discourse coherence. The minimal propositional units, i.e., the two individual sentences in (29) or the two clauses in (30), are called elementary discourse units, and are labeled π_1, π_2, etc.. Since we're going beyond sentence boundaries I assume a dynamic rather than a static, truth-conditional semantics for these elementary units. Specifically we'll use a version of Discourse Representation Theory (DRT, Kamp et al. 2003). A discourse unit usually introduces various discourse referents, including discourse referents for events and states. Thus, the first unit in (29) introduces a discourse referent for Jin[19] and a discourse referent for the crying eventuality. In the traditional box notation, compositionally interpreting that first unit yields the following (simplified) Discourse Representation Structure (DRS):

(31)

x e
jin(x)
crying(e,x)

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[19]If Jin has been mentioned before, the name's referential presupposition actually binds to the discourse referent introduced earlier, but we're mostly skipping over the details of presupposition and anaphora resolution.

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In classic DRT we'd use the second sentence to update this DRS directly. In SDRT, the interpretation of a discourse yields a more complicated structure called an SDRS. In an SDRS elementary discourse units give rise to their own separate, labeled DRS boxes. SDRT provides a number of axioms that constrain the inference of various coherence relations between these elementary discourse units (see Asher & Lascarides 2003).

(32)   a. π_1:Jin is crying. π_2:Sun lied to him.

b.

π_1:	e x	π_2:	e' y
	jin(x)		sun(y)
	crying(e,x)		lied(e',y,x)
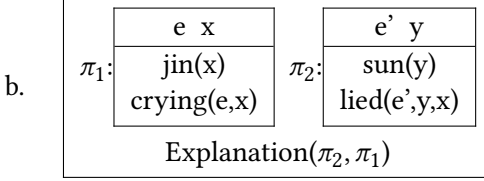
Explanation(π_2, π_1)

The model-theoretic interpretation of SDRSs is guided by the semantic interpretation of the coherence relations. The interpretation rule for Explanation tells us to update the common ground with the contents of the DRS boxes associated with both discourse units, in addition to the relational information specific to the coherence relation in question – in this case, that the event introduced by the first relatum is the cause of the event introduced by the second. Abbreviations: K_α stands for the DRS box labeled α, e_α stands for the main eventuality introduced in the universe of the DRS box labeled with α, and $\oplus$ stands for the merging of DRSs. DRS boxes are semantically interpreted relative to a possible world index w and a variable assignment f.

(33) $[\![\text{Explanation}(\alpha, \beta)]\!]^{w,f} = [\![K_\alpha \oplus K_\beta \oplus \boxed{\text{cause}(e_\alpha, e_\beta)}]\!]^{w,f}$

The thing to note about (33) is that the coherence relation of Explanation defined thus is 'veridical'. Its occurrence commits us to the truth of both relata, or rather, dynamically, to evaluating both associated DRSs K_α and K_β as updates on the common ground relative to which the relation is to be evaluated.

5.2 Attribution as a coherence relation

Discourse theorists have proposed analyzing speech and thought reports in terms of a non-veridical discourse relation called Attribution (Hunter 2016; Altshuler & Maier 2022). Maier 2022 argues for such a discourse analysis on the basis of unembedded continuations of reports like in (34).[20]

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[20]An anonymous referee brings up closely related examples of discourse reporting without embedding in English, involving propositional anaphora (*John fears this. A witch is trying to kill*

(34) a. Dani went to bed early. He dreamed that he was a frog. He jumped around a bit and then he was eaten by a stork. (Maier 2022)

   b. Sie sagte sie habe   keine Zeit. Sie müsse   noch 86
       She said she have-SUBJ no   time. She must-SUBJ still 86
       Prüfungen bewerten. (German)
       exams   grade
       'She said she has no time. She still has 86 exams to grade (, she said)'
       (Bary & Maier 2021)

   c. Trump says he'll cut inflation in half. He'll also create record numbers of jobs and beat COVID before Christmas.(Maier 2022)

In each case an explicit indirect discourse is followed by a free-standing main clause which intuitively provides a further specification of the content of the reported dream or speech, respectively. Following Maier's (2022) semantic analysis, (34-c) would be segmented as follows:

(35) π_1:Trump says π_2:he'll cut inflation in half. π_3 :He'll also create record numbers of jobs π_4:and beat COVID before Christmas.
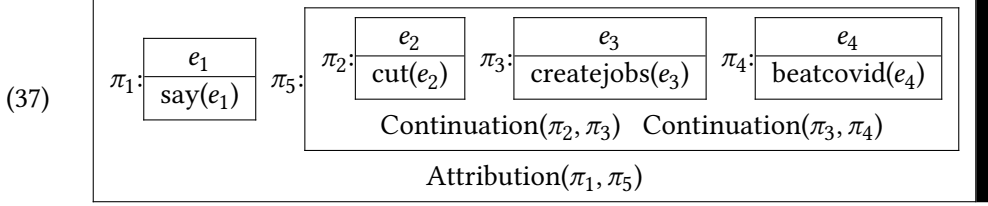
Importantly, the indirect discourse report in the first sentence is analyzed as consisting of two elementary discourse units, π_1 (*Trump says*) and π_2 (*he'll cut inflation in half*), each contributing a DRS of its own (from here on, for readability, I'll further simplify the basic DRSs to include just the eventuality discourse referent, ignoring individual discourse referents). These units will be connected by the coherence relation of Attribution. In this case, I assume that the grammar of indirect discourse informs the SDRS construction algorithm directly that Attribution is involved between the report frame unit (π_1) and the syntactically embedded clause unit (π_2) – just as an overt *because* as in (30) would inform the algorithm directly that Explanation is involved. Concretely, interpreting just the first sentence in (35) (i.e., units π_1 and π_2) yields the following SDRS:

(36)
$$\pi_1: \boxed{\begin{array}{c} e_1 \\ \hline say(e_1) \end{array}} \quad \pi_2: \boxed{\begin{array}{c} e_2 \\ \hline cut(e_2) \end{array}}$$
$$\text{Attribution}(\pi_1, \pi_2)$$

Now consider the next sentence (i.e., units π_3 and π_4). We assume that, in context (considering global output coherence and general world-knowledge), these units

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him) and contentful noun continuations (*John had a dream. A witch was trying to kill him*). Indeed, on the current proposal both of these would involve the inference of an Attribution relation between syntactically independent discourse units.

are most plausibly interpreted not as the author's description of what will happen, but as further specifications of what Trump claims will happen. We model this reading in SDRT by introducing a complex discourse unit π_5 that contains essentially a conjunction (Continuation, in SDRT) of π_2, π_3, and π_4. That complex unit then replaces π_2 in the second argument slot of the Attribution and thereby as a whole provides the content of what Trump said.

(37)

π_1:	e_1
	$say(e_1)$

π_5:

π_2:	e_2	π_3:	e_3	π_4:	e_4
	$cut(e_2)$		$createjobs(e_3)$		$beatcovid(e_4)$

Continuation(π_2, π_3)   Continuation(π_3, π_4)

Attribution(π_1, π_5)

Formally, the semantics of Attribution corresponds to the compositional, contentful eventuality analysis presented in section 2.1, but now not at the syntax–semantics interface, but at the level of interpreting a coherence relation in a segmented discourse representation.

(38) $[\![\text{Attribution}(\alpha, \beta)]\!]^{w,f} = [\![K_\alpha \oplus \boxed{\text{content}(e_\alpha,{}^\wedge K_\beta)}]\!]^{w,f}$

In words, α must provide a contentful eventuality e_α and the content of that eventuality corresponds to the proposition expressed by β (borrowing classic Montague 1973 notation, ${}^\wedge K_\beta$ denotes the set of worlds where K_β is true, i.e., 'the proposition that K_β'). Importantly, Attribution so defined is non-veridical in its second argument. The speaker is in no way committed to the truth of the discourse unit occupying that second argument, much like in our previous compositional analysis of indirect discourse the speaker is not committed to the truth of the embedded clause proposition (Section 2.1).

Now recall that in our original compositional analysis, what we've later referred to as the 'intensionality' of indirect discourse could be traced back directly to the subordinating complementizer taking a propositional argument (of type $\langle s, t \rangle$), provided by the embedded clause (via IFA). On the current discourse-structural analysis the complementizer and the syntax of clausal embedding play a rather different role: they merely serve to constrain the choice of coherence relation. The grammar of indirect discourse is a sufficient but by no means necessary condition for the deployment of the non-veridical, i.e., intensionality-inducing, Attribution relation. This is already illustrated by the interpretation of the second sentence in (34-c). This sentence is just a conjunction of two main clauses, without a trace of a complementizer or clausal embedding syntax. Still, the eventual

discourse representation we constructed puts this conjunction under the sematic scope of an Attribution, and hence interprets it intensionally. As Maier 2022 notes, the only way for the compositional analysis to derive this reading would be by reanalyzing the apparent main clause as an embedded clause within the syntactic scope of a complementizer (either merging the new clauses with the previous sentence's embedded clause, or postulating a new *he said that* frame).[21]

In quotation and free indirect discourse, we also find apparently independent, free-standing main clauses that are ostensibly interpreted as reports.

(39)   a.   "Oh, we'll be cutting," Trump told the audience. "But we're also going to have tremendous growth." (Maier 2022)

        b.   He smiled. Oh yes, he would get back at them. Eventually.

Although a more sophisticated semantics of Attribution then just (38) is necessary to analyze these cases (Maier 2022), we do not need to, nor want to, rely on an invisible grammar of clausal embedding to generate intensionality.

5.3 Recursive discourse in the absence of recursive sentences

The analysis sketched above corresponds exactly to what Everett suggests: "there can be recursive discourses in the absence of recursive sentences". Take the Trump example (34-c) again. The second sentence shows no sign of (recursively self-applicable) clausal embedding in its grammatical structure, yet in the discourse semantic interpretation provided in (37) we find a (recursively self-applicable) intensional report construction in the form of the Attribution relation. Instead of putting all the recursion in the syntax we have moved it to the level of discourse representation.

Syntax can constrain the construction of a complex SDRS in various ways, but equally complex semantic structures can also arise from more pragmatic pressures alone. Unfortunately I haven't seen a concrete example of a second order report in Pirahã to illustrate this, but as we've seen above there's a related discussion about the status of role shift in various sign languages, so let's look at Quer's example (28) of second-order reporting in LSC from Section 4.3.

(40)   JOAN IX3a THINK <role-Joan MARIA IX3b SAY> <role-Maria VOTE FOOL-ISHNESS>

      'Joan thinks that Maria has said that voting is silly'

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[21]Maier 2022 provides arguments against both.

Quer's English translation involves repeated application of clausal embedding, unambiguously expressing a complex thought reporting Joan's thought about Maria's speech act about voting. Interestingly, the way Quer glosses the LSC does not clearly indicate a double syntactic embedding. Strictly speaking, assuming a truly grammatically recursive role shift operator he could have instead chosen the representation in (41) to show off the nested embeddings:

(41)   JOAN IX3a THINK <role-Joan MARIA IX3b SAY <role-Maria VOTE FOOL-ISHNESS > >

As far as I can tell, it will be very difficult to distinguish which of these two representations better describes the data. Phonologically, both parses would look the same: first the speaker role-shifts to Joan, and then to Maria.[22]

My point now is that, from a semantic point of view, we don't need phonology or syntax to decide between the parses in (40) and (41). We can turn straight to the pragmatically informed discourse semantics to derive the correct interpretation either way. Concretely, the syntactically distinct LSC parses in (40), with two iuxtaposed role shifts, and in (41), with recursive role shift in role shift, as well as the fully explicit English indirect discourse paraphrase, can lead to the same discourse representation, expressing a report about a report. To see this, let's start with the minimal syntactic parse in (40), without a recursive hierarchy of embedding built in. In SDRT terms we simply have three discourse units, two of which are marked by a role shift which we interpret as a phonologically realized signal that they need to be connected via Attributions.

(42) π_1:JOAN IX3a THINK π_2:<role-Joan MARIA IX3b SAY> π_3:<role-Maria VOTE FOOLISHNESS>

Discourse interpretation proceeds linearly, starting with units π_1 and π_2, which unambiguously gives us the following representation:
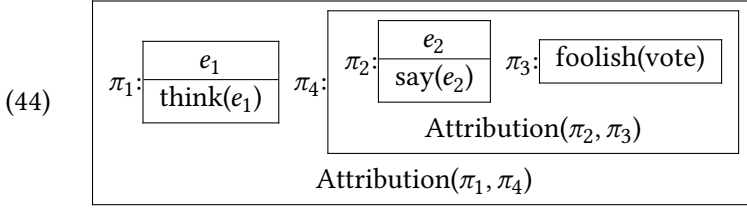
(43) π_1: $\boxed{\dfrac{e_1}{\text{think}(e_1)}}$ π_2: $\boxed{\dfrac{e_2}{\text{say}(e_2)}}$

Attribution(π_1, π_2)

For the next unit, π_3, we know from the role shift that it needs to be connected via an Attribution. In fact, Quer's parse already indicates that it's Maria whose

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[22]We have the same difficulty in spoken English quotation: it's hard to phonologically distinguish a demonstration of Will Smith's speech act from a demonstration of Jaden Smith's demonstration of Will Smith's speech act, especially when we add a third layer as in (27).

speech is being reported, from which we can infer that the Attribution must connect this π_3 to π_2. As before when analyzing the continued report (34-c) in (36) and (37) we have the option of treating π_3 as part of a complex unit together with π_2. Combined with the above mentioned constraints this choice leads to the following output discourse representation:[23]

(44)

$$\pi_1: \boxed{\begin{array}{c} e_1 \\ \hline \text{think}(e_1) \end{array}} \quad \pi_4: \boxed{\begin{array}{c} \pi_2: \boxed{\begin{array}{c} e_2 \\ \hline \text{say}(e_2) \end{array}} \quad \pi_3: \boxed{\text{foolish(vote)}} \\ \text{Attribution}(\pi_2, \pi_3) \end{array}} \\ \text{Attribution}(\pi_1, \pi_4)$$

The resulting representation shows a recursive, nested application of intensional embedding. This discourse-level interpretation of (44) is entirely equivalent to the interpretation we would compositionally derive for the overtly double embedded English translation (as analyzed before in (8) in Section 2.1).

6 Conclusions

In this chapter I've used the Pirahã controversy to explore the relation between clausal embedding and reporting. I've started from the assumption that Pirahã, like English or ASL, allows its speakers to report what others say or think, and also what others say or think about what yet others say or think. Everett famously claims that this language does not have recursion and a fortiori nothing like English indirect discourse, the inherently, grammatically, and ineliminably recursive clausal embedding construction that we most readily associate with the expression of such complex, recursive thoughts in English.

In Sections 3 and 4 we've looked at alternative ways of reporting, specifically zooming in on hearsay evidentials and direct discourse, respectively. I concluded that these constructions differ semantically from each other and from indirect discourse. However: (i) it's not always easy to draw a sharp line between direct and

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[23]The only other prima facie possible output would leave π_3 at the global SDRS level, without forming any complex unit. The non-veridicality of Attribution actually renders this seemingly well-formed SDRS modeltheoretically uninterpretable (the introducing of e_2 is semantically closed off by an intensionalization operator ($^\wedge$) and hence will not be accessible for a proper interpretation of Attribution(π_2, π_3). It may well be possible to tweak the modeltheoretic semantics of non-veridical relations in SDRT in such a way that this configuration gets interpreted as equivalent to (44). These technicalia are for a different paper.

indirect discourse; (ii) direct discourse appears to be as recursive as indirect discourse; and (iii) the combined use of hearsay evidentiality (for efficient communication and decision-making based on tracking information sources) and direct discourse (for vivid descriptions of characters' speech and thoughts in narratives) actually covers a wide range of uses we might express with indirect discourse in English. It is thus not a priori implausible that a language like Pirahã that has both hearsay evidentiality and direct discourse constructions can do without an additional category of indirect discourse without much loss of expressivity.

In Section 6 I went one step further, exploring Everett's suggestion that "there can be recursive discourses in the absence of recursive sentences". Modern semantic/pragmatic analyses of discourse coherence can derive this principle as a by-product of the independently motivated analysis of reporting in terms of a coherence relation of Attribution. Crucially an explicit report construction like English 'x says that p' is merely a special case where the Attribution relation is explicitly encoded in the surface grammar, just like Narration can but need not be explicitly marked by 'and then' and Explanation by 'because'.

In the process of evaluating Everett's seemingly controversial claims about Pirahã this chapter has provided two arguments against the apparent necessity of a report construction based on clausal embedding – indirect discourse – to express a full range of complex human thought: (i) indirect discourse fulfills two main functions, one narrative, which can be approximated by an equally recursive direct discourse construction, and one evidential, which can be approximated by hearsay evidentials; and (ii) reporting in general, cross-linguistically, is best analyzed as a discourse phenomenon, and working this out ultimately moves the recursion and intensionality away from the grammar into a more pragmatic, discourse-structural level of semantic representation.

Acknowledgements

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